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ABSTRACT

This annual report presents six research articles on child development. The articles and their authors are: (1) "Beyond Psychological Limits: Applying Human Development in Education" (John Kirkland); (2) "Beyond Reductionism: Directions toward Understanding Children" (Frank Self); (3) "A Psychometric Examination of the Children's Behavior Questionnaire" (Emiko Kusanagi); (4) " 'Behavioral Space Therapy': An Alternative Approach to 'Handicapped' Children" (Emiko Gotoh); (5) "Absence of Avoidance Response to Impending Collision in Children" (Shing-jen Chen and Geert J. P. Savelsbergh); and (6) "Looming: An Information Source for Avoiding and Making Contact" (Geert J. P. Savelsbergh and Shing-jen Chen). (MM)

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FACULTY OF EDUCATION
HOKKAIDO UNIVERSITY
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RESEARCH AND CLINICAL CENTER FOR CHILD DEVELOPMENT

Annual Report
1991-1992
No.15

March 1993
Editor: Kunio Wakai

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***TABLE 4**

Correlation coefficients among variables

subjects	Q nAch × Q nAff	Q cAch × Q cAff	Q nAch × Q cAch	Q nAff × Q cAff	P nAch × P nAff	P nAch × Q nAch	P nAch × Q cAch	P nAff × Q nAff	P nAff × Q cAff
5th graders	.21*	.53***	.28**	.30**	.18*	.27**	.21*	−.06	−.03
8th graders	−.14	.61***	.51***	.44***	.25**	.08	.08	.14+	.04
senior highs	.02	.40***	.25*	.41***	.21*	.17+	.09	−.15	−.07
college	−.01	.49***	.34***	.25*	−.02	.12+	.11	.17*	−.02
total	.01	.52***	.38***	.34***	.16***	.15***	.15***	.05	−.01

+$p<.10$ *$p<.05$ **$p<.01$ ***$p<.001$ Q=questionnaire P=projective technique
nAch=achievement motive, cAch=self concept of achievement behavior
nAff=affiliation motive, cAff=self concept of affiliation behavior

BEYOND PSYCHOLOGICAL LIMITS: APPLYING HUMAN DEVELOPMENT IN EDUCATION

John Kirkland
Massey University

Abstract

In this introductory essay a new type of professional is identified and named as Educational Developmentalist. Such persons are concerned with formulating appropriate theory and putting into practice a philosophy which accepts two as its minimum working unit. They endorse the concept of ecological niche in which organism and setting are entwined. And they are knowledgeable about the range of provisions, from biological to cultural, including constraints and opportunities across generations.

Keywords: Educational developmentalist, human development

In Europe, the notion of a self contained individual arose in conjunction with socio-political changes triggered by the French Revolution. This was exported to various colonies and has become epitomised in the genre of movies known generally as "Westerns": an armed, lone drifter makes his mark and accepts the consequences of his actions, whether as villain or hero.

This idea has a powerful grip on our imaginations. As an academic discipline and area of study "psychology" has been nurtured in a hegemony which has as its nucleus the twin concepts of self and of control. Even a cursory examination of North American psychological history reveals the extent to which such constructions have served to create a respectable conservative "ecclesiastical" order. It is precisely because students of psychology have tended to limit their enquiries to an individualistic ideology that their horizons concerning human development have been restricted to a flat earth approach.

The following points identify and illustrate some concerns about contemporary approaches to studying human development.

First, since so much of human development is taught in nonPsychology Departments (including, for instance, Anthropology, Sociology, Education and Family Studies) then psychologists ought to be wary of staking any exclusive claims. Human development is neither a branch nor a subdiscipline of psychology. Indeed the reverse is true: psychology, amongst others, may offer some approaches to studying human

Request for reprint should be addressed to Professor John Kirkland at Department of Education, Massey University, Palmerston North, New Zealand.

development. Unfortunately there is often a slippage from discussing "human development" to terms of "developmental psychology". This "error" is perpetuated by many text authors who entitle their books "Human Development" but within the opening chapter define this as "Developmental Psychology". The point to be made here is that the academic study of human development involves much more than many psychologists appear to be aware of or concerned about.

Second, as may be expected, the hub for most psychologists is "the individual". Radiating from this centre are numerous spokes. One declares the unique unit is a machine-like part, shaped from reinforcement contingencies and oiled subsequently by conformity. Another spoke demonstrates how an early cradling in an unconscious sea of fantasies represents scripts passed down familial lines. A third spoke adopts the cleanliness of sterile laboratory environments, devoid of social contamination, to study thought; whether as cognition, or perception or intelligence. A fourth spoke addresses collectives, but these are typically mere aggregates of individuals. Connecting these and other spokes provides the rim of psychology's wheel. This is hardly surprising given the socio-political contexts in which psychology has been nurtured in the West. My point is that a narrow focus upon bounded individuals, no matter how well-intentioned, is crippling developmental studies. This is not to deny either the relevance or the importance of individuals in contemporary society.

Such individual orientations may well be central for psychology but they are marginally relevant for human development. Unfortunately, many of the so-called contextualists with their Matroiska doll metaphor are still putting individuals in their places.

A third point is that merely shifting a developmental window from a particular isolated period to a life-span approach does not necessarily change an underlying individualistic orientation. It is as if the same fixed-focus lens has been used but zoomed to merely extend a general frame.

Fourth, although pluralism is often endorsed this can quickly become too top-heavy or too ornate, either toppling over or hiding essential features behind a façade of trivia. Authors of a contemporary text entitled "Human development across the life-span" encapsulate this point nicely by their unintentional howler when writing: "Human development is the study of an individual's development from birth to death from an interdisciplinary perspective" (Hughes and Noppe, 1991). Part of the trouble with giving lip-service to pluralism is that proponents often assemble a range of contributions but join them almost arbitrarily like separate railway carriages, linked but not fused.

In summary of these developmental biases my poins are: that the study of human development ought not be confused with developmental psychology which is a narrow specialty derivative; that an individual hub as the epicentre of action creates a psychological unicycle suitable for flat-earth journeys hugging familiar coastlines; that "life-span" approaches are often simply extending a snap-shot frame whilst still perpetuating an individualistic ideology and, finally, that a multi-disciplinary approach may well lead to factionalism if competitiveness remains unbridled.

Each of the above points is now addressed. A general aim is to provide an alter-

native view about human development study, as a backdrop for Educational Developmentalists.

First, the scope of human development is as extensive as there are ways of getting along with others. There are well-known age differences, typically represented by familiar stage theorists (like Piaget and Kohlberg). There are also functional phases declared by social groupings (represented by Erikson). And, in addition, there are relevant gender issues to consider (such as Josselson and Gilligan point out). Less obviously, there are cultural and genetic histories involved and the tools of representation or mediation (that Vygotsky mentions). We are gradually becoming aware that some cherished notions like "self" are not universal but socially constructed (as Harre aptly acknowledges and argues). As a simple and practical example, should you ask scholars to name those who have made the greatest contribution to the study of human development, then a broad crosssection will be reported with few psychologists included.

The second point is much more difficult to appreciate because a complete alternative is required, a whole different philosophy. We have tended to endorse the self-contained individual, especially in the West, with firm self-other boundaries, a sense of personal control and exclusivity. As Sampson (1988) notes an alternative is in ensembled individuals having fluid boundaries, field control and a sense of inclusiveness. In a similar vein others are suggesting a "dialogical self" exists beyond rationalism and individualism (e.g. Hermans, 1992). One subtle point here is that we are debunking the ideology of individualism but not individuals. That is, regardless of one's philosophical orientation there are still skin-bounded, bi-pedal, distinct units. However, just because such entities can be graded, transported or put into a workforce does not mean this is the only significant study unit. In spite of what managers may wish, generals desire, politicians vie for or psychologists declare humans are more connected to one another than they are separated. What is called for is a philosophy of "us-ness" rather than "me-ness", of "thou" rather than "you". Social groups which do not highly value or use frequently personal pronouns (like I, you, he/she), identical twins, religious orders which are uncontaminated by a self-contained individualism can make important contributions to our understandings about human nature.

Psychology, as the study of individuals, is more often than not about power. In understanding the dynamics of social power we need to comprehend the architecture of social institutions and their histories. Although legitimate power is available, as mentor, guide, teacher, power is so often corrupted into aggression or dominance, and antagonists such as submissiveness or helplessness. Into this web of individualism psychology has ensnared the study of human development quite unwittingly. Educational developmentalists need to be aware of their histories; of what contributed to their presence. However, it is the endorsement of twoness, of duality without paradox, which establish an alternative working base.

For the third issue, consider a cycle of seasons. This is hard to document with only a set of unrelated snapshots. Of course we can "read" a season in an outdoor photograph by identifying sunny skies, green-leafed trees and "light" weight clothes usually worn in summer. But in doing so we are aware of what to look for, knowing

already that seasons do exist. My point is that unless there is movement, a series of events connected by an underlying theme, then single episodes are unique, unrelated and separate. Thus, to continue the analogy, we can read a person's behaviour if we are aware of their relationship history and have a sense of salient developmental themes. To create these themes is an important task which will demand concerted effort from many scholars. One is to appreciate phylogenetic contributions upon ontogenetic development, of being able to document why it is certain relationship styles are functional and how these are sustained by social constructions. As a group, attachment theorists are on the right path here but they are not yet free of an individualistic ethos.

Pluralism, my final point, is often accepted by developmentalists as an invitation to include a greater range of topics. Unfortunately though, this can quickly deteriorate into confusion because there is just too much to assimilate. And, more to the point, it is typically a mere extension of monism, the cult of the individual. Both of these aspects are recognised in contemporary text books which are like directories about individual growth and development.

How can Educational Developmentalists (EDs) be expected to be different, to offer services which others are not already providing? In short, what is their habitat? I suggest several themes.

First, EDs are not only offering a psychological orientation. They may well need to be involved with individual assessment, be this for personality, cognitive advantage or impairment, or even attachment style. For EDs the concern is not a fully functioning self, but a self in relationships. As social scientists we will attend to the dynamics of broader settings, nestling personal accounts into the general situation. Of critical importance here is the recognition that EDs begin from a dyad so that individual data merely supplements rather than organises involvement. Thus outcome measures are interpreted in terms of relationships with others; as parents, as clinicians or as partners.

Second, since "power" is one of the more important constructs in many social systems EDs will need to recognise its various expressions. To understand power behaviour it is necessary to recognise the power motive, "a disposition to strive for certain kinds of goals, or to be affected by certain kinds of incentives" (Winter, 1973, p. 17). In my opinion we cannot escape from power's influence since this is a basic human motive. How the motive is nurtured will depend to a large extent on the affordances offered by social networks. Amongst emergent personal styles adapted to prevailing social conditions are: aggressive-hostile, depressed-helpless, cold-withdrawn, compulsively helpful and, finally, domineering. These are all separate themes of the power motive, and particular variations will be played out for selected audiences. Not only are there cultural differences in power related behaviour, there will be gender preferences too.

Once again let me emphasise, this approach begins with twoness; it does not take for granted individual responsibility. In any educational context it is the setting tone which determines outcomes. Knowledge too will need to be reconfigured; rather than something which is privately owned it is shared collectively, generated and accepted by groups. Telling others what to do and how to do it is obviously power in

action, but whether this is with gentle encouragement or direct bullying makes a world of difference to what transpires.

A third reorientation theme involves ecological considerations. The greening of our beliefs and actions has accelerated over the past two decades, hastened by environmental concerns about pollution, ozone depletion and virus contamination. Traditionally, many researchers have been attending to mapping habitats, documenting demographic features from a naive systems perspective. That is, they tend to compartmentalise phenomena and merely describe interactions all the while maintaining discrete entities. In my opinion J. J. Gibson's view about niche is relevant. A niche refers to how an organism lives, involving a radical view of bound organism-setting interdependence (Kirkland and Morgan, 1991). As mentioned previously, individuals are selected and are important for some purposes. It is when these elements are reified and treated as being unique, without attention to any emergent co-dependencies, that a monist ideology is maintained.

An ecological perspective requires an understanding of adaptiveness. This includes a sense of interdependent wholeness without undue attention to any single aspect. Like the familiar analogy; a combination of elements like oxygen and hydrogen produces a water molecule which has characteristics which could not be predicted by any consideration of separate components. The same thing applies to growing humans, and this needs to be taken into accounts about development. The heart of the matter then is how people get along.

In many countries the familiar nurturent group is changing; single parents, unemployment, refugee camps, starvation, pollution, disease are contributing to a different sort of understanding about human development. We are only beginning to grasp the magnitude of these matters for a species and have little data to guide policy decisions. In many instances all too familiar expressions of power are dominating; civil disobedience, ethnic group violence, and outright war are inflicting tremendous damage. Educational Developmentalists, aware of human nature and its varied forms of expression, can make a positive difference; know how to intervene with what and when. In my opinion it would be helpful to examine the concept "developmental ecopathology" to get additional bearings on relevant issues.

My next theme addresses another basic human motive; namely affiliation (or cooperation). This has been emphasised by feminist authors, many of whom have advanced alternative theories, methods and therapeutic interventions based on a "web of relatedness".

Educational Developmentalists already have available a rich literature about human attachments; corresponding theory, means of collecting relevant data, adequate interventions and colourful descriptions about life-story trajectories when pathology dominates to saturate family relationships. Bowlby's "secure base" metaphor, military though it is, goes some way toward emphasising affiliative involvement as a cornerstone for ongoing healthy development. Anxious babies, whether resistant/ambivalent or avoidant, and disorganised ones are likely to emerge from familial settings where the ethos is one of power-dominance; corrupting affiliation by nipping it in the bud.

A final theme concerns engagement. Educational Developmentalists have a professional responsibility to take a socially acceptable place in community settings; early child care, injury or prison rehabilitation, trauma centre, family therapy or schools. My own thinking on this matter is that EDs have a moral obligation to get involved and can make best estimate predictions about human development outcomes whatever the intervention of choice. Some EDs may choose to become embroiled in matters of policy within organisations through committees or by consultation, others may make signal contributions to their professional associations and others may elect to become involved with the dispossessed, families in plight, children cast out or people hurting deeply, afraid or violent. EDs can make a difference because they are aware of developmental pitfalls and possibilities.

Rather than being relegated to backup status, waiting to be called onto the playing field, EDs are in the midst of play itself as active team members. Education consists of involvement in a culture with fundamental knowledge created within an ecological niche which is, naturally, social. Such education is far more difficult to understand than derived knowledge which can be passed on by trainers or skilled instructors and assessed by familiar psychometric methods (Elkind, 1989). There is a subtlety in many educational activities which can be sensed by those attuned to ecological concerns but this is often difficult to explain objectively simply because it often involves the unspeakable; words fail.

In summary, Educational Developmentalists are acutely aware of the broader meaning of education. Education does not belong in any one place, it is not limited by buildings or programmes; it is the very essence of what goes on between people who are involved in cooperating even though one may be older or wiser or more skilled than the other. Power is undeniable but it can be positively toned rather than destructive, especially if attention is shifted from dominance to commonance. If we can reduce the fear of being hurt or injured, perhaps by taking each other's hands in peace, then trust may be initiated. From trust, like acorns, bigger things grow.

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BEYOND REDUCTIONISM: DIRECTIONS TOWARD UNDERSTANDING CHILDREN

Frank Self
Saint Joseph College

I saw this recently in Japan, but the same type of planning for young children is common in the United States. A kindergarten, in many ways quite a good kindergarten, took a bus load of 4 year olds on a field trip to a factory. This field trip had some very attactive features: the mother of every child was able to attend, the factory makes a product which children tend to enjoy and consume, and, not insignificantly, there was no cost involved, even the bus was provided by the factory. This should have been a clue. Factories are owned by commercial, that is, profit making, companies.

The trip was to take the entire morning, so there were no other plans to engage the children. The place to catch the bus was not near the center. The bus was late, about 30 minutes. The bus, designed for adults rather than children, was without seat belts, but it included a hostess as well as the driver. The travel route was through heavily congested city streets and the ride lasted 30 minutes or more. On the bus, attendance was taken and songs were sung, including two with large teacher-made books held in the front of the bus so the children could follow as they sang. The factory was new and handsome, and included, so it seemed to me, the latest in technology. The factory was also designed for tours. We were welcomed by the usual bowing workers, then taken to a room full of adult-size tables and chairs. On the tables in front of every chair was a wrapped straw. Soon a woman introduced herself as our tour guide. The tour would now begin. We left the straws, and our guide lead us up a short stairway and down a hallway to a section with solid windows on both sides from which we could look at the machines below. Small items were moving in various directions while a few people in white coats and facial coverings watched the machines and occasionally did something. Then we were guided along to another room to see a TV show about this factory's products. After that we returned down the same hallway and stairway, back to the room with the tables, chairs and straws. Now next to each straw was a small bottle of drink. We drank. Then the windowshades closed automatically, and the room became dark. The children made it-has-suddenly-gotten-dark sounds. Then a movie began, a cartoon about a boy and two vitamins who travel down a throat and into a stomach where they watch a battle (with we-are-watching-a-battle sounds from the children) by the bad bacteria and the good bacteria or some-

Request for reprint should be addressed to Professor Frank Self at Department of Child Study, Saint Joseph College, West Hartford, CT 06117 USA.

thing like that. The movie concluded with telling everyone what needs to be in every child's breakfast: toast (not rice!), egg, ham (or something that looked to me like ham), cucumber, and the drink with the two vitamines. This was followed by a movie of one of the 100-year-old twin women, the one who has drunk this drink for 30 years. The movies ended. On our way out we were given bags of some of their products (including a can of fruit drink with 20% natural fruit juice) and advertizing material. Those who needed to went to the toilet. Photos were taken outside with the company bus as the background. A soccer ball (or do you call it a football?) and cases of more drinks were given to the director to take back to the kindergarten. We got on the bus for another 30 (or more) minute ride. During this trip a child spilled hot tea on himself, which hurt for awhile, but did no damage. More songs were sung, including some sung by children with the bus microphone, karaoke style. We arrived back at the place where we had caught the bus, two and a half hours before. We said goodbye to the hostess and the driver, collected all of our things, and got off the bus. The trip was over, and the bus drove away. But the children were thirsty, so the bottles were opened and drunk. Then the children and the mothers took a short walk to a pleasant, shaded area and had a picnic lunch.

All in all, it was a most successful trip. The children couldn't have behaved better. Other than the minor incident with the tea, there were no problems. Or were there? Let's look at this trip from other points of view. These are 4-year-olds. A major characteristic of children this age is large motor physical activity. Children this age need and want to run and chase—start, stop, turn, duck, as fast as they can. But this trip required them to wait for the bus (some of the children were able to run a bit during this time), to climb on the bus, to sit in adult size seats on the bus, to walk together into the hallway of the factory, to sit in a room with adult size furniture, to walk up stairs and along a hallway, to stand and look at a room below, to sit and watch TV, to walk along the hallway and down the stairs, to sit in the room with adult furniture and watch a movie, to walk to the toilets, to walk outside, to wait while photos were being taken, to sit on the bus, to climb off the bus, and then to walk to the area for the picnic lunch where they sat and ate. Some of these activities extended for considerable lengths of time.

Another major characteristic of children this age is investigation and manipulation of physical objects. Children touch, poke, move, lift, drop, throw, twist what they can get their hands on, and they search for every possible object to explore with their hands and their minds. Except for the snacks the children brought from home and first the straw—by itself!—and then the drink, there was nothing for the children to do with their hands. Possibilities contained in the bus were effectively curtailed through close adult supervision.

For children who characteristically run and explore with their hands, how can they engage in such extended, controlled motor activities. There are a number of explanations. First, their mothers were all there, providing directions and encouragement and, when needed, food, drink, and physical contact to help relieve tensions. Second, this was a special event only two trips a year. So the children probably knew that they had to behave especially well; they may have been told this explicitly by

their mothers and by their teachers. Third, they were probably familiar with the factory product and hoped that they might have some to drink while they were there, so they had to be good, otherwise they might not get their drink. Fourth, it was a large group and everyone else was doing the same things at the same times, all reinforced by teachers and mothers; there were no deviating models present. And fifth, except for the straw and drink and toilets, there was absolutely nothing for the children to get their hands on. Even all the surfaces were hard, cold, and plain, obviously designed for ease of cleaning and people flow.

All of the children's activities were adult prescribed and controlled. Waiting for adults; using a bus and a building made for adults by adults and without any modifications to make them more fitting for use by children; proceeding as if they were on a conveyer belt: walk here, stop and look, walk here, stop and look. The comfortable, but passive, TV and movies appealed to the children even though the information presented was incomprehensible to them (just like TV and movies at home). The messages were clearly directed to adults: buy, buy every day, buy for your child, buy for yourself. (Even if you are 70, by buying our drink you can reach 100. And be famous.) There was nothing in the factory for the children to do except walk and, toward the end, drink the (little) drink. There was nothing requiring them to think, except for the unintentional local incident of the spilt tea on the bus and the three children who sang karaoke style on the return bus trip. There was nothing requiring them to make a choice. There was, except for the unplanned for time waiting for the bus and the karaoke singing which became group singing, no peer interation, another major characteristic of children this age.

Particularly troublesome is the hidden agenda conveyed directly to the mothers and indirectly to the community. By the very fact that this type of trip is arranged, it receives a status of approval. This type of trip is appropriate for 4 year old children. It is all right for young children to be passive, to be confined for long periods of time in restrictive spaces, to have nothing to do with their hands. It is all right for adults to totally control children's bodies and minds. It is even all right when all that the adults at the factory want to do is to use children to further their own goal to stay in a profit making business. It is approved by the excellent kindergarten, the kindergarten chosen by the parents for their children, the kindergarten which is a function of an academic program in child development and education in a prestigious university. The knowledgeable director and teachers, who you respect and like so much, plan such programs for the children in their charge. They not only plan such programs, they do it for one of the special two days out of the whole year. It is not only right, it is excellent; obviously better than other kinds of activities for young children.

Loris Malaguzzi (1988), the developer and former directer of the municipal preschool program in Reggio Emilia, Italy, has asserted that too often adults treat children as if they were Christmas trees: cutting them down and removing them to a domestic, and alien, setting; decorating them so they look pretty; enjoying them for a season; and then throwing them away. Now this kindergarten and this field trip did not engage in such exploitation of children as Mallaguzzi described. No active harm and abuse were perpetrated. And yet there is a common factor. With the desire and the inten-

tion of providing for specific children, the field trip plan neglected to consider the complex and dynamic natures and developmental needs of those children. As with each blind man in investigating the elephant, the focus was on only one aspect of the child, in this case, young children's positive disposition to receive a gift, no matter what the cost. Given this focus, conclusions were reached which were devoid of all awareness of the children as thinking feeling acting humans of complexity, needs, and history.

Howard Lane, the professor I studied with in San Francisco, referred to such conceptions as "partsome," opposing it to "wholesome," as in "a wholesome child." Such partsome conceptions of children are common. We can find parents who see eating habits or school achievement when they view their children. We can find teachers who see group behavior or motivation for school lessons when they view their students. We can find researchers who see motor development or cognitive deficits when they view their population samples. We can find librarians who see reading activities or a lost book when they view their library patrons. Such approaches contain advantages only for the adults-the parents, teachers, researchers, librarians, and others who think in this way: it simplifies our thinking processes. The result is the conception of a child as simple, something easy to fit into our own meaning constructs, own own orientations, our own prejudices.

Sometimes in our efforts to expand our knowledge of children, we court the danger of reducing our conception of children. One example. In the U.S. it is accepted practice for university departments in social sciences to require graduate students (and sometimes undergraduate students) to engage in research. Because in the U.S., universities divide the year into either three semesters or four quarters and few students can afford indefinite stays in the status of student, if the student is to pursue independent research which goes beyond library review, there is a definite need to select a research question which can be pursued within a relatively short period of time, say a few months. So we look for something small, even if it is insignificant. Then the location needs to be accessable and convenient to the student. All of this means, of course, experimental methods, no longitudinal study, and, more often than not, a laboratory or clinical setting, preferably on campus. And the analysis will almost inevitably be statistical, especially with the statistical software programs on our computers. So typically, student research is quick, quantitative, and experimental; and sometimes what students learn falls short of what Lane referred to as wholesomeness of children.

Sometimes university professors are not as alert to the problem as they might be, thereby being able to counteract the distorted view the student is taking. With the academic culture of "publish or perish," many professors find themselves in not dissimilar circumstances, so their views can be similarly restricted. Most professors are not in the position of receiving large grants which would enable them to mount large, comprehensive, and long term research projects. Instead they mount projects which can fit into their teaching schedules and their budgets: a small sample, a short period of time, experimentation, and statistical analysis. All too often, that's not what is really important. Every researcher worth his salt knows how to get four to six journal articles out of each research study. If two or three get published, that's an excellent percentage; it's time to move on to another subject and another little research study. And so it

goes. One's resume gets longer, and one's chances of moving up the academic ladder become greater. And sometimes what professors learn falls short of what Lane referred to as wholesomeness of children.

In his introduction to Vivian Paley's book, *Mollie Is Three*, Michael Cole (1986) addressed this matter as follows:

> During its short history in the United States, academic research on child development, like other branches of the behavioral sciences, has been preoccupied with problems of scientific methodology. If one samples any of the leading journals in the field, it soon becomes clear that quantitative methods, preferably quantification based upon experimental manipulations, are the major source of evidence about the processes that propel children's development. The virtues of such an approach are clear. Quantification and experimental control provide an objective data base which can be used to warrent causal claims about the factors that accelerate and retard development.
>
> At the same time, the application of experimental techniques to the explanation of, and prediction of, human behavior also suffers from a number of acknowledged shortcommings. For purposes of the present discussion, two difficulties are most serious. First, as Walker Parcy wryly comments, "There is a secret about the scientific method which every scientist knows and takes as a matter of course, but which the layman does not know... The secret is this: Science cannot utter a single word about the individual molecule, thing, or creature in so far as it is an individual but only in so far as it is like other individuals" (*The Message in the Bottle*). Applied to psychology, the discipline which studies individual behavior and consciousness, this limitation on the scientific is particularly disheartening.
>
> Second, it is an accepted truth that development is not an instantaneous process; it occurs over time, which means that time must be taken to allow the dynamics of the process to reveal themselves. Yet most experimentation (and most observations of children for that matter) involves only very brief time samples, owing to problems of cost and practicality, among others. (pp. vii viii)

The problems are increased through the commonly held principle of originality. Replication of previous research is avoided, no matter how important the previous research might be or how great might be the need for replication. The problems with the principle of originality is keenly felt in relation to dissertations for the doctorate degree, yet there have been few breakthroughs to date. With the increasing numbers of graduate students pursuing doctural dissertation research, the range of vision gets more and more narrow. Some improvement has resulted from the increasing, although still minor, use of qualitative analysis.

American society has frequently been accused of reification of the child, that we love and respect the idea of the child but that we just don't like any real, live children. This seems to be even more clearly the case regarding adolescents. One reason for this is children's play. We just don't understand real children's play. Here are some examples of one form of children's play, play with language:

This first one is of 3-year-olds in Vivian Paley's classroom in Chicago (Paley, 1986).

"Let's play in the doll corner. Let's be kittens, okay?"

"Yeah, let's be real kittens."

"Are you a hexigon [*sic*] kitty?" Mollie asks, setting the table.

"I'm the mother."

"We're both mothers. Leslie is the baby."...

"I'll be the baby," Margaret says, curling up in the crib. "Tell me to go to bed. Are you angry?"

"Go the bed! I'm angry!" Mollie shouts.

"Then you have to go to bed too, Mommy, so I won't cry."

"Oh, oh, nighttime. Go to bed!"

"Oh, oh, morning. Wake up."

"Oh, oh, nighttime. Go to bed!"

"Oh, oh, morning. Wake up."

The girls repeat their [language repetition] game six more times before they are ready to change the plot. (pp. 35-36)

The next comes from a 4-year-old boy in New York City (Sutton-Smith, 1981).

Once upon a time there was a family of tigers, bears, and lions
and they went out for a wild animal picnic
the wild animal picnic was made of baby rabbits
that's what they ate
they took the rabbits alive and they killed the rabbits at the picnic
and when they ate the rabbits the blood washed out all the meat where
they were chewing so they missed all the parts where they were chewing
when they missed it they only got a tiny bit of tooth left
they kept chipping their teeth 'cause they forgot to take out the bones
they kept chipping their teeth so much they only had one tooth on the top and one on the bottom
then they swallowed the rabbit
after they chipped their teeth and had dinner they went home and had roasted beef rabbit
then after they swallowed the rabbit and after they had dinner they went to sleep and they all dreamt the same thing
and that's all. (*p. 110*)

Here is another child in one of Vivian Paley's classes (Paley, 1981), a 5-year-old girl.

Once upon a time there were three evil witches. They had a big pot full of witches' chicken soup. One heard a knock on the door. "What evil knock?" Then she went to the door and answered it. It was a little girl. The witch said, "You should get locked up in our take-time-out machine." Then the girl said, "I forgot. This is the wrong house." she tried to get out but they grabbed her. Then they had their soup. They laughed at the little girl. Then they heard another knock at the door. It was their grandmother with the

witches' little boy to eat the soup. "May I have some?" asked the little girl. "Yes, you may." So the witches gave her soup and let her go free. (p. 175)

This one comes from a 7-year-old boy in New York City (Sutton-Smith, 1981). It's an item on what he calls "Nixon's Favorite Menu."

Dinner

A hamburger contains of a wrench, a screwdriver, metal from a cavity and a lit lightbulb.

Bun contains of 1% starch, 99% electricity

Corned beef contains of 100% starch topped with shaving cream.

I like most restaurants. When most restaurants give you a rabbit's foot for good luck-we give you a human foot for good luck, but we mix it in with the food. (p. 214)

The last example of children's language play (I decided not to include any in this presentation that were really outrageous.) is from an 11-year-old, quite obviously from the United States (Fine & Mechling, 1991).

I pledge allegiance to the flag
Michael Jackson is a fag
Pepsi-Cola burned him up
Now he's drinking Seven-Up.

Well! It's no understatement that adults feel perplexed by children's play. Children's imaginations shift so quickly from one perspective to another, reflecting bits and patches of cultural artifacts, fantasies, and feelings. But while we cannot fully comprehend it, we know, or think we know, at least we have a strong feeling that we know, that either children are wasting their time (that is, they are not being productive from our very middle class perspective) or, and this is most troubling, we are being laughed at and everything we believe in is being laughed at. For the most part, these feelings are caused by our inability to fit children's play into any neat conceptual category. So to reduce our own discomfort, we seek to control children's play, to change it, sanitize it, domesticate it, and, most agreeably for us, stop it. It does not take much imagination on our part to hear adult voices saying to any and all of the children quoted above, things like: "Don't say things like that." "Be nice." "Don't be so silly." "Don't use words like that." "Don't you have something better to do?" "I don't know where you get ideas like that. You certainly didn't learn them from me." Riley (cited in Salamone & Salamone, 1991), in her article on the value of play in *Young Children*, the journal of the important American organization The National Association for the Education of Young Children, sums up this all too common position as follows:

> "Play," in some quarter, has become almost a dirty word. The assumption seems to be that, though play is a necessary activity of childhood that can't be eliminated entirely, it lures children off the path that leads most directly toward the kind of intellectual growth and success our society wants of its young people. (p. 137)

It is fascinating to me, but also very troubling, to note the large number of early childhood programs with which I am familiar that include the word "play" in their advertising to parents or even in their names, but, in their daily activities with children,

seek to eliminate play in favor of "learning activities" (that is, those activities directed or controlled by adults and viewed as productive of adult ends) or distort play to such an extent that it is recognizable as play only to another adult. Here are some examples.

Some years ago in Connecticut, undergraduate students in my course in advanced observation reported a learning activity for 3-year-old girls. (The boys had been directed to another room for another activity, one that involved trucks.) The teacher told the 3-year-old girls that they were going to play "tea party." Tea party, she went on to explain, involved dressing up and having tea. The children were to line up and she would dress each of them in dress-up clothes, and this they did and that she did. Then they were to sit at the tables, which they did. At this point the director entered the room and asked them if they knew what they were supposed to do at a tea party. None of them did, so she told them. Gossip. And did they know what they were supposed to gossip about? Again they expressed their ignorance on this subject. They were supposed to gossip about the boys they were going to marry.

Admittedly, this is an extreme example, even for Connecticut. But recently in Japan I attended an early childhood conference presentation of exemplary practices. Included were two videos. The first showed kindergarten children (I would guess close to 80, maybe more) in elaborate costumes in a large gymnasium performing intricate drill routines, routines modeled on those seen in the opening ceremonies of Olympic Games. This was followed by two children performing xylophones as expertly as in any Olympic synchronized swimming routine. After the video had finished, the teacher quietly but proudly stated that she had worked with these kindergarten children for 90 minutes a day for 4 months. The second video showed 191 4-year-olds engaged in extended rhythmic physical exercises.

In the Connecticut scenario we have an example of early childhood curricula which distorts play to such an extent that it has very little to do with children. Here children are used as material to achieve ends which have everything to do with the adults involved. Here the children are totally dominated and dictated to. At best, the teacher and director can be said to be misguided. Perhaps they had heard that dress-up and dramatic play were appropriate learning activities for young girls, but were ignorant of the processes which needed to be involved which make them carry learning forward. I am thinking of processes such as the children selecting the story line and the roles which can be incorporated by the story line; the children deciding whether props and costumes are needed, and, if so, selecting the various materials which can serve for props and costumes; the children assembling the props and putting on the costumes themselves, asking for help of another child when needed, and giving help when requested by another child; the children engaging in social use of language and physical action to develop a sequence of related events which follow the story line; the children judging when events are proceeding according to their own understandings of the story line and the story's roles; and the children deciding on and effecting any needed modifications or changes in direction, including the decision to stop and do something else. But what could be the reason for the teacher and the director, both veterans in teaching young children, to select such an inappropriate subject for the play

of 3-year-olds? It boggles the imagination. I suspect that this "learning activity" results from the director's and the teacher's fundamental rejection of children's play as something that they can condone in their program. At the same time, they present their center to the parents and the community as "child oriented" and "developmentally appropriate." They solve this problem by having children go through some of the motions of play, but controlling, totally controlling, everything the children do.

In the first Japanese video, where the teacher promoted performance rather than play, the children surely developed certain competencies and the enhancement of self-esteem that accompanies the acquisition of competencies. Certainly their parents were delighted with their achievement. And perhaps there was an article with an accompanying picture in the local paper, perhaps even some coverage on TV. Certainly at this early childhood conference, the teacher felt nothing but pride at a tough assignment well done. Yet I question such use of children's time.

It is not the time that was spent. There is a widely known film (Commune di Reggio Emilia, 1987) of a class of 5-year-olds in Reggio Emilia, Italy, in which the ongoing activity lasted for 4 months. This activity centered on a statue of a lion on the edge of the town's central market square. This lion was the children's old friend which they had visited often throughout their lives. The lion was imposing but small enough to climb on, powerful but a little bit old. The class made special visits to examine the lion and talk to it, think about what they knew about lions, and what they could discover about this lion. They took photographs of the lion from different vantage points at different times of the day. They devised ways to measure the lion and traced the lion's shadow as the shadow changed size and shape, devising ways to measure the various shadows. They made a mold of the lion's paw. They went back to their school and played lion-roaring, pouncing, watching, sleeping, eating, resting, stretching, running, walking. And the photographs that they had taken of the lion, they projected them on to their own bodies, so they could see themselves with the lion, the lion with them, comparing shape, comparing size. Then they worked with shadow puppets of lions, also making their own bodies part of the shadow puppet presentations. They worked with clay and many clay tools to create their lion, each one following his or her own ideas about the lion, each one developing his or her own skills with the clay and the tools. They worked with pencil and paint and colored markers, again following their own ideas, developing their own skills. They talked together about the lion that they knew so well, as well as the real lions in the real world and the fantasy lions in their imaginations. They searched for information about lions in books and also in comic books. One of their teachers made a lion head and paws of foam rubber (some of the children helped him make it) and gave it to the children so they could once again play lion. The continued to develop their ideas and feelings about the lion through clay and paint and pencil. And all of these activities about the lion were among the many other activities in the young children's lives, such as eating and napping, having birthdays and making friends, going to grandmother's farm and watching the cows get milked. The film was made of the activities by one of the teachers, nothing professional yet rich in life and learning. Four months. Long, flowing periods of time can give children opportunities to develop their ideas and skills, to develop them-

selves. Long, endless periods of repetition, of following the dictates of an adult, can reduce and distort children's feeling about their own worth and purpose.

The second Japanese video, the 191 4-year-olds all doing the same physical activity--it reminds me of the fad in the U. S. during the 50's of seeing how many people can get in a phone booth at the same time. The major difference is the matter of choice: in the phone booth situations, although surely social pressures were involved, the adults probably had some degree of choice in deciding to engage in the play; in the case of the 191 4-year-olds, they did not. In times of national military buildup, such behavior by adults has a purpose. But 4-year-olds in present day Japan? I wonder about the concerns and fantasies of the adults involved.

Let us look once again at developmental and learning activities in which young children are engaged, activities which seek to address the wholeness of children's beings. The first involves a 5 year old in his home in France (Williams & Kamii, 1986).

> A mother asked her 5 year old to put out the napkins for the main meal every day. There are four people in the family, and Jean-Pierre could count to about 30. On the first day, he took out only one napkin to put on a plate. He then returned to the cupboard for a second napkin, and so on, making four trips. At 5 years, 3 months, and 16 days, he suddenly thought to count the plates, then counted four napkins, and distributed them on the table. He proceeded in this way for 6 days.
>
> On the 7th day, there was a guest and one more plate. Jean-Pierre took four napkins out as usual, distributed them, and noticed that one plate remained empty. Instead of getting an additional napkin, he collected the four already on the plates and put them back in the cupboard. He then began all over again and made five trips.
>
> The next day, the guest was not there, but Jean-Pierre made four trips, and continued the same method for 5 more days, until he again thought to use counting. After 10 days of counting, Jean-Pierre was told that there was to be a guest again. He distributed his four napkins as usual, but this time went to get the missing napkin when he saw the empty plate. The next day, when there were only four people again, he counted the number of plates before fetching the same number of napkins. The arrival of a guest never disturbed his napkin distribution system again. (p. 25)

Here we see a number of striking features. Jean-Pierre's mother gave him a task to do, that is, she was able to share her responsibilities with her young son and then determined a task which she believed he could accomplish. The task chosen was one that was important to and would directly benefit all members of his family. By carrying out this task, Jean-Pierre would not only increase his skill but also his value to his entire family, the outcome of his task being clearly observable at and contributing to the family's daily communal ritual. Once his mother gave him the task, she let him pursue that task on his own terms and in his own ways, resisting all impulses to rescue him from inefficiencies and time consuming approaches. Therefore, he was put into a position in which he had to judge the adequacy of his work, and, when he deter-

mined inadequacies, he had to invent methods of action which would, again according to his judgment, remove the inadequacy and provide a situation which would meet the requirements of his given task. Surely, by so doing, he increased his conception of himself as a person capable of pursuing a task of importance and changing requirements, a person of competence who can accomplish a task through his own thinking and actions, a person who can directly contribute to the well-being of his family and their circle of friends and associates.

How fortunate he was to be free of well-meaning adults and older children who wanted to help him, for inevitably such help results in stopping his thinking, forcing upon him a pattern of action which conflicts with his understanding. Howard Lane would refer to such help as cutting off the tadpole's tail. While the tadpole might look more like an adult frog, this tadpole will still be a tadpole, but now one without a tail. And you don't get a frog sooner by cutting off the tadpole's tail. Many teachers, especially, force-feed children, on the premise that children will, armed with new and better armor, be able to think and act more maturely. By being free of such artificial manipulation, Jean-Pierre was able to develop his own thinking processes. The consequence was that he did learn more mature thinking strategies and, most importantly, he understood why his later thinking strategies were preferable to his earlier ones. Using a phrase from the Nobel Prize winner Szent-Györgyi (1964), he "lived his learning" (p. 1278). And surely his disposition was strengthened toward further challenges and further learning.

The next example of developmental and learning activities in which young children are engaged is a classroom situation in Connecticut in the 1970's (Self, 1978/1979). The children, children ages 4 through 7, had been on a field trip to a small peanut factory where peanuts were roasted and bagged. The children were unable to participate in the activities of the factory, but they were able to closely observe the large bags of raw peanuts being opened, portions of the raw peanuts put into a closed container where they were roasted, roasted peanuts put onto racks to cool, and then the cool roasted peanuts put into small bags which were then sealed and boxed for shipping to stores. They were given bags of both raw and roasted peanuts to take back to school. The following took place in their classroom after the trip. In addition to the teacher and the children, there were some parents who had gone with them to the factory.

Teacher: What do you like to eat that is made of peanuts?
Children: Peanut butter!
Teacher: Would you like to make peanut butter?
Children: Yes!
Teacher: What do we have that we could use to make peanuts into peanut butter? (One child goes quickly to the cabinet and pulls out the meat grinder.)
Child 1: The meat grinder.
Teacher: What makes you think that the meat grinder will change peanuts into peanut butter?

Child 1: Well, when we ground the cranberries with it, it came out all mashy. (This is a reference to an activity during the previous November.)

Child 2: And the potatoes. They came out brown just like peanut butter. (This is a reference to preparing potato latkes [pancakes] during the previous December.....

Teacher: What else can we use to make peanut butter?

Child 3: Step on them.

Teacher: How?

Child 3: Just put 'em on the floor and step on 'em. That'll make peanut butter for sure.

Teacher: Would you leave the shells on or take them off?

Child 3: Uh, take 'em off or leave 'em on. Either way it'll make peanut butter.

Child 4: I know a way. You can put them in the blender.

Teacher: Would you check to see if we have a blender here now. I don't remember.

(A check was made; no blender was found.)

Teacher: We have something else much like a blender, but with larger blades.

Child 5: A food processor.

Teacher: Yes. We can see what that will do with peanuts. Any other ideas? What else do we have; what other ways can you think of to make peanuts into peanut butter?

Child 6: How about a peanut butter maker?

Teacher: Good idea. We don't have one.

Child 6: Oh.

Child 7: Hey, I know. We can use the hammer and hammer them.

Teacher: Would you take the shells off first?

Child 7: Yup.

Teacher: What about the skins?

Child 7: Yup.

Teacher: I see. Are you sure you would want to take the shells off first?

Child 7: Yeah. I would.

Teacher: How would you take them off?

Child 7: Like this. (The child puts a peanut between his teeth and cracks it open).

Teacher: Who would eat the peanut butter you would make?

Child 7: I would

Child 8: I wouldn't

Teacher: [Speaking to Child 7.] Why do you think Kanalpa wouldn't want to eat your peanut butter?

Child 7: Don't know.

Teacher: Kanalpa, can you tell Louis why you wouldn't want to eat...

Child 8: 'Cause it's been in your mouth.

Teacher: Is there some other way you can break the shell and not smash it all into peanut butter?

Child 7: Easy, man. Easy.

Teacher: Show me with your hand how you would hammer it just to break the shell.

(Louis goes through an elaborate slow motion demonstration.)

Teacher: Now, how will you hammer it to make peanut butter?

(Louis immediately bangs his hand down hard on his knee causing some pain, which he tries to conceal.)

Teacher: I see. (Referring to his hurt.) Fortunately we have a cutting board to make the peanut butter on. You can use it as a hammering board. [To all the children.] Any other suggestions for ways to make peanut butter?

Child 9: Smash them.

Teacher: What?

Child 9: Smash them.

Teacher: Yes, smashing peanuts will make peanut butter.

Child 10: I know a good way. Use your teeth.

Teacher: That's an excellent way to make peanut butter for yourself. It make the perfect size: bite size. But what about sharing the peanut butter with your friends?

Child 10: No.

Teacher: No. That's not a very good idea. But for peanut butter for one, it's ideal.

Child 11: How about punch them?

Teacher: Try it. See if it works.

Child 12: I know another way. You could smash them under a chair leg. You could put a peanut on the floor and put the chair leg on it and then sit on it.

Teacher: On the floor?

Child 12: Yeah.

Teacher: Wouldn't the peanut butter get terribly dirty?

Child 12: Well, we could put the chair on the table.

Teacher: And sit on it on the table?

Child 12: Yeah.

Teacher: What about all the dirt on the bottom of the chair leg?

Child 12: Well, we could use soap and water and wash it.

Child 5: I know. Get a new chair.

Teacher: Buy a new chair just to make peanut butter?

Child 13: If you got a plastic bag, you could put your peanuts in it. Then the peanut butter would be clean.

Teacher: My! That's a fine idea. Anything else? Can you think of any other ways that peanuts could be made into peanut butter?

Child 14: We could boil them first.

Teacher: That's true. We could boil them first. Now, let's get busy making peanut butter. Let's experiment with each of the methods. Would you adults help us out? If each of you worked with a different small group of children on one activity, it would be great. Now, let's see what we are going to do. I'll write the different ways to make peanut butter on the board. Then we can decide who is doing what.

The session continued. Everyone was involved in at least one method. Someone remembered the book press and that was tried, also. The chair on the table was the most spectacular, the boiled peanuts the most unexpected. The hammer method was quite a disappointment. Everyone was surprised at how many different ways there are to make peanut mash, inadequate as peanut butter, but still good to eat. The meat grinder with the small blade made quite crunchy, but good, peanut butter. The food processor produced what the children said was really peanut butter. (pp. 170–174)

Some weeks later the class was visited by a representative of a nutrition education program connected with the State Land Grant College. One of the parts of the nutrition education program involved showing children how peanut butter could be made by crushing peanuts with a baby food jar wrapped in tape. The visitor was amazed at what the class had done, and saw no reason to go to such trouble when it was easy to crush them with a baby food jar. Karl, 6 years old, spoke up: "Yeah, but if you only know one way and you can't do it that way, then you need to know another way to do it." (p.175)

Clearly, this teacher is not interested in demonstrating one method by which the children are to accomplish the assigned task. Following the learning principle of many materials/one action, one material/many actions, the teacher is interested in stimulating children to investigate a variety of methods to act on one material. The teacher encourages the children to think of many ways in which they can accomplish the desired physical change in a familiar and positively regarded material. And for the most part, the teacher is receptive to their ideas. Also, this is not a contest in which the "best" idea, as decided by the teacher, wins. All of the ideas are tried out, and they are tried out by the children, not by the teacher. The children are active in providing ideas. They listen to each other, and sometimes they get a related but different idea from an idea expressed by another child. The children are active in putting their ideas into practice. They get the materials that they need and decide on how they will use the materials. The children are active in judging the outcomes of their actions. They decide what is acceptable and what is not, what is peanut mash and what is really peanut butter.

This is a school experience which is rich in learning. One reason the learning is so rich is that the classroom is rich in material resources. Nicholson, the American landscape designer who was a leader in participatory involvement of users in the design process, wrote in his essay "How Not to Teach Children: The Theory of Loose Parts":

The simple facts are these:

1. There is no evidence, except in specific cases of mental disability, that some young babies are born creative and inventive, and others not.

2. There is evidence that all children love to interact with variables, such as materials and shapes, smells and other physical phenomena, such as electricity, magnetism and gravity; media such as gases and fluids; sounds, music and motion; chemical interactions, cooking and fire; and other people, and animals, plants, words, concepts and ideas. With all these things all children love to play, experiment, discover and invent and have fun. All these things have one thing in common, which is variables or "loose parts." The theory of loose parts says, quite simply, the following:

In any environment, both the degree of inventiveness and creativity, and the possibility of discovery, are directly proportional to the number and kind of variables in it. (p. 30)

In all too many classrooms there is a paucity of things, a paucity of a variety of things. A classroom composed of multiple tables, chairs, desks, books, and bulletin boards can hardly compare with what this classroom must have contained, if we can assume that its meat grinder, food processor, hammer, cutting board, plastic bag, cooking device which could boil peanuts, and book press are examples of its array rather than the total of its contents.

We see Nicholson's theory in operation when children delight in the wrapping, the ribbon, and the box while the present they contained, with more significance for the giver than interest for the child receiver, receives little attention. We see it in such active settings as adventure playgrounds (but, infortunately, rarely in settings with that name in the United States; to see any great number, one has to go to Great Britain, Scandinavia, and other areas in Europe and get there before these are closed by narrow thinking public authorities). We see it in static settings where young people who, desperate to make some impact on their world, commit what is termed by others "vandalism," although they may see it as "making something happen."

In this "peanut butter" classroom there are many ideas which come from the teacher and also-and especially-from the children. In addition, there are many loose parts, many things with which the children can try out, extend, and develop their ideas. John and Eizabeth Newson (1979), the English developmental psychologists, have observed that children must manupulate things with their hands before they are able to manipulate ideas in their minds. Constance Kamii (Williams & Kamii, 1986), who has insightfully applied Piaget's theories to classroom practice, clarifies this point as follows:

> When we talk about the child's action, we rarely use the term manipulation. The reason is that manipulation refers only to the external act, which can be mindless. Piaget's term action refers to mental action, which is often accompanied by physical action in early childhood.
>
> When we gently squeeze a plum or a peach to find out how ripe it is, we do so because we want to know something about the fruit. The important part of our action is the mental part, without which the external act would be

mindless manipulation. (p. 25)

Young children physically act on the objects as they put them into relationships. As they grow older, they become able to group, order, or divide them in their heads without touching the objects at all. In short, the manipulation of objects is desirable in the logico mathematical realm because young children think better when they physically act on the objects. (p. 25)

However, objects have value in the young child's environment which goes beyond physical or logico mathematical thinking. (Logico mathematical thinking, by the way, concerns the mental process of making a relationship between one object and another.) Objects also provide children with the opportunity to develop skills, skills in the use of objects both as materials and as tools. Diversity of objects provides children with greater opportunity to make connections between their children's environment and their home and community environment, and, based on these cultural connections, to extend their social connections through language and action with their teachers and the other children. And when children are able to combine one object with another, one loose part with another loose part, they can increase the complexity of their activity and their thinking.

I would like to conclude by returning to the previous topic of research in the field of psychology. Roger Barker, in his *Ecological Psychology* (1968), discusses the emphasis in psychological research on behavioral measurements.

But there is an incompatibility here: to achieve stable behavior measurements, stable conditions must be imposed upon the person, and the same conditions must be reimposed each time the measurement is repeated. This method provides measures of individual constancies (under the designated conditions), but it eliminates individual variations (under different conditions), and it destroys the naturally occurring contexts of behavior.

The problem is not peculiar to psychology. The strength of a beam can be measured only under specific conditions, and under the same conditions each time the measurement is made. But a beam has many strengths depending especially upon its structural context. The same is true, too, of the meaning of words. Words have a range of meanings, the precise one being determined by the context in which it occurs. A good dictionary gives a number of these meanings, the model meanings; but for greatest precision it uses the word in revealing contexts. A person is like a beam or a word: he has many strengths, many intelligencies, many social maturities, many speeds, many degrees of liberality and conservativeness, and many moralities. (pp. 5-6)

I want to pursue this idea of the multiplicities of a person, relating it directly to the multiplicities of a child, but first I want to share with you a passage from *The Way of the Carpenter* (1990) by William Coaldrake, the first non Japanese member of the Kyoto Dentoo Kenchiku Gijutsu Kyookai (Kyoto Guild of Traditional Master Builders):

The carpenter believed that the spirit of the tree had to be accommodated in its new location at the building site, but he had to know the environment in which it grew to maturity for practical reasons as well. In this context the

> old adage that the carpenter "does not buy a piece of wood but buys the mountain" (ki o kawazu yama o kau) is very true. The original orientation of the timber to the north or south had to be respected. This was not only to placate its spirit but also to ensure the suitability of a timber to its new location in a building; south-side wood is better adapted to warmth and should once more face south, whereas north-side wood is better able to withstand cold temperatures as it confronts the penetrating winds of winter. (pp. 25-26)

To take us back to children, here is a passage from Betty Smith's *A Tree Grows in Brooklyn* (1968):

> And the child, Francie Nolan was all the Rommely's and all the Nolans. She had the violent weaknesses and passion for beauty of the shanty Nolans. She was a mosaic of her grandmother Rommely's mysticism, her tale-telling, her great belief in everything and her compassion for the weak ones. She had a lot of her grandfather Rommely's cruel will. She had some of her Aunt Evy's talent for mimicking, some of Ruthie Nolan's possessiveness. She had her Aunt Sissy's love for life and her love for children. She had all of Katie's soft ways and only half of the invisible steel of Katie.
>
> ...She was made up of more, too. She was the books she read in the library. She was of the flower in the brown bowl. Part of her life was made from the tree growing rankly in the yard. She was the bitter quarrels she had with her brother whom she loved dearly. She was Katie's secret despairing weeping. She was the shame of her father staggering home drunk.
>
> She was all of these things and of something more that did not come from the Rommelys nor the Nolans, the reading, the observing, the living, from day to day. It was ... the something different from anyone else in the two families ... the one different thing such as that which makes no two fingerprints on the face of the earth alike.

We recognize ourselves in these passages, not, perhaps, in the details, but in the realization of our own complexities, our multiplicities, our quidities. We recognize these in ourselves, and we must strive to realize that these are also commonalities and that these commonalities can be recognized in our own children and in the children with whom we do our work. It is easier to recognize these in our own children; we are able to observe our own children in many different situations over long periods of their lives. It is harder to recognize these in the children with whom we do our work, because we are not able to observe these children in many different situations over long periods of their lives. And since we relate to them in one aspect of their lives and usually in one environment of their lives, we focus on what we know best and on where we put our efforts, stressing the commonalities and tending to forget that there are other parts of the children's worlds, parts that we may know nothing about. But knowing this, being conscious of the limitations of our perspectives and our information, we can do two things. First, we can deliberately act in ways which do not reduce the complexities, multiplicities, and quidities of children, their "many strengths, many intelligencies, many social maturities, many speeds, many degress of liberality and conservativeness, and many moralities." Second, we can deliberately act in ways which

encourage and support the curiosity, the wonder, the quidities, the multiplicities, the wholesomeness of children. The extended activities in Reggio Emilia on the lion are, I think, an excellent example, as are the activities in France of placing napkins on the family dining table and the activities in Connecticut of making peanut butter. All of them provide for children to be who they are and engage in processes which help them become who they want to be, and at all times remaining whole and developing whole.

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A PSYCHOMETRIC EXAMINATION OF THE CHILDREN'S BEHAVIOR QUESTIONNAIRE

Emiko Kusanagi
Hokkaido University

ABSTRACT

The Children's Behavior Questionnaire (CBQ) developed by Rothbart was examined in terms of four psychometric properties of scales and items: distribution of answer for each item, internal consistencies, homogeneities, and discriminant properties of temperamental scales. Although a few items were inadequate in distribution of answer, most items were found to be able to discriminate among Japanese children effectively. All scales proved to have satisfactory internal consistencies and homogeneities, except the Attentional Focusing and Sadness scales. There was found to be moderate levels of correlations across some scales. It is safe to conclude that the CBQ has strong psychometric qualities.

INTRODUCTION

Recently, there has been increased interest in temperament. One reason is that temperament has been useful to clinicians to identify children who pose problems to their caregivers in the future. Another reason is that developmentalists would like to use temperament primarily to refer to characteristics of individuals, usually with the ultimate goal of understanding the causal base of developmental consistencies or changes in behavior or the genesis of individual differences(Hinde, 1989).

Three methods are widely used to assess temperament in infancy and childhood, parent report using questionnires, home observation, and laboratory observation. Of the three, parent report is most widely used because of inexpensiveness and ease of administration. The most frequently used temperamental questionnaires were those developed by Carey and his colleagues (Carey, 1970, 1972; Carey and McDevitt, 1978; Fullard, McDevitt, and Carey, 1984; McDevitt and Carey, 1978). These were designated on the basis of the New York Longitudinal Study (NYLS) conceptualization of temperarent (Thomas *et al.*, 1963). While these instruments have been successful for clinical purposes, predicting later behavioral problems to some extent, they are problematic for developmental psycholgists to study temperamental stability or instability over time. The questionnaires based on the NYLS dimentions have been criticized for having psychometrically inadequate properties (Buss & Plomine, 1984; Rothbart & Mauro, 1990). For example, the conceptual nonindependence of scales was evident

Request for reprint should be addressed to Emiko Kusanagi at Department of Developmental Psychology, School of Education, Hokkaido University, Sapporo 060 Japan.

between the Mood and Approach scales, and between the Distractibility and Attention Span scales. The overlap of conceptual definition should necessarily bring about item overlap across these scales, in turn yielding high intercorrelations among these scales. Indeed, by factor analysis of the nine dimensions, only two dimentions emerged as relatively pure factors (Buss *et al.*, 1984; Sanson *et al.*, 1987; Sugawara *et al.*, 1988). It was pointed out that a less reliable scale was less capable of demonstrating stability across ages (Rothbart and Mauro, 1990; Sugawara *et al.*, 1988). In order to examine the consistencies or changes of temperament over time, temperamental constructs should have conceptual independence across dimmensions and their scales should have high internal reliabilities.

In contrast to Carey's questionnaires, Rothbart and her colleagues developed questionnaires with strong psychometric qualities that measured individual differences in various facets of temperament (Goldsmith and Rieser-Danner, 1990; Goldsmith and Rothbart, 1991). They wished to assess dimensions of temperament that would be conceptually independent, that is, designed with no conceptual overlap among operational definitions of the measures. Because they expected that parental biases might operate most strongly when parental judgments were global or involve comparing one's own child with others, they worded all items to refer to concrete behaviors in specific situations. In addition, to maximize each scale's internal consistencies, items were deleted selectively on the basis of their item-scale correlations.

The questionnaieres developed by Rothbart and her colleagues are the Infant Behavior Questionnaire (Rothbart, 1981), the Toddler Behavior Assessment Questionnaire (TBAQ) (Goldsmith, Elliott, and Jaco, 1986), the Children's Behavior Questionnaire (CBQ) (Rothbart, 1988), the Early Adolescent Temperament Questionnaire (EATQ) (Capaldi and Rothbart, 1990), and the Physiological Reactions Questionnaire (PRQ) for use with adult subjects (Derryberry & Rothbart, 1988). In all, the questionnaires available allow longitudinal studies of temperament from infancy to adulthood (Goldsmith and Rothbart, 1991). They reported that all of these questionnaires have high internal consistencies for each scale. Additionally, the IBQ scales were demonstrated to have high discriminant properties and considerable convergence with home observation and laboratory measures (Rothbart, 1986; Goldsmith and Campos, 1990). The TBAQ scales were also found to be largely independent (Goldsmith and Rothbart, 1991). These questionnaires seem to be useful to investigate developmental stability or instability of temperament. In this study, the psychometric qualities of the CBQ was examined. Until now, there have been few reports for the CBQ. The CBQ for use between 3-7 years of age is a caregiver-report measure that assesses 15 temperamental scales, each consisting of 12-14 items. Definitions of temperament scales and sample items are presented in the Appendix.

The psychometric qualities of the CBQ were examined in terms of four fundamental properties of scales and items. First, the distribution of answers was examined for each item to confirm whether each item discriminated the subjects effectively. Second, coefficient alphas for each scale were computed in order to examine internal consistencies of the CBQ scales. According to Rothbart, estimates of alpha were high for the scales of the CBQ except for the Attentional Focusing sale, ranging from .67 (Sad-

ness) to .90 (Shyness) (Goldsmith and Rothbart, 1991). Although Rothbart recently divided original Attentional Focusing scale into two new scales (Attentional Focusing and Attentional Shifting), the items of Attentional Focusing scale in this study were original compositions of scales. Third, factor analysis was done to make sure of the homogeneity of each scale, because the inference of homogeneity solely on the basis of coefficient alpha is insufficient (Windle, 1988). There has been a tendency to equate internal consistency (as indexed by coefficient alpha) with unidimentionality (homogeneity) in the temperament literature. A homogenious test is one in which all items converge on the measurement of a single factor. Finally, the intercorrelations among scales were computed to examine the discriminant varidity of each scale. Interscale correlations are desired to be low. For the IBQ, TBAQ, and PRQ, however, significant correlations were found among temperament scales. It is expected that there are some significant correlations among the CBQ scales, because most of dimensions assessed in the CBQ were derived from the IBQ and PRQ. The scales derived from the IBQ are the Activity Level, Anger/Frustration, Fear, Falling Reactivity & Soothability, and Smiling & Laughter scales. The scales from the PRQ are subcomponents of arousal, self regulation, and emotional reactivity, referring to the Attentional Focusing, Discomfort, High Intensity Pleasure, Inhibitory Control, Low Intensity Pleasure, Perceptual Sensitivity, Fear, Falling Reactivity & Soothability, Sadness, and Anger/Frustration scales.

METHOD

Subjects :

Mothers whose children go to one of the three kindergartens (numbers were 104, 161, and 170) in a town of 50,000 residents near Sapporo City were asked to complete the questionnaires. The questionnaires were taken to mothers by their children through each classroom teacher and were returned after a week. A total of 372 mothers filled out the CBQ, and the return rates for each of the kindergartens were 91.3%, 87.6%, and 80.0%, respectively. The distribution of ages and sexes is presented in Table 1.

The Children's Behavior Questionnaire :

The CBQ is comprised of 195 items that describe children's reactions to a number of situations. All items were directly translated into Japanese, except a few items which referred to a TV show (Mister Rogers) and nursery rhymes, and were transformed according to Japanese practices. Mothers were asked to rate whether each item was a "true" or "untrue" description of their children's reaction within the past six

TABLE 1

Subject Age and Sex Distribution (N=372)

	Age							
	3 Years		4 Years		5 Years		6 Years	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Number of Subjects	8	8	63	45	81	83	54	30
Percentage of Sample	2.1	2.1	16.9	12.1	21.8	22.3	14.5	8.0

months on a scale from 1 (extremely untrue of your child) to 7 (extremely true of your child). When a mother could not answer because of not having seen their child in that situation, mothers were asked to circle X (not applicable). It takes about one hour to complete the CBQ. Scale scores for the CBQ were computed by summing all numerical item responses for a given scale. When a mother omitted an item, or checked the "does not apply" response option for an item, that item was not included.

RESULTS

1. *Distribution of answers for each item*

The distribution of answers was checked out for each item. Two items received no response or were marked "dose not apply" by more than 15% of the sample. One item ("My child has a hard time settling down for a nap") comes under the Falling Reactivity & Soothability scale, the other item ("My child rarely smiles and laughs when playing with pets") comes under the Smiling & Laughter scale, and the percent of no response or "does not apply" are, respectively, 32.5 and 23.7.

Some items were rated two multiple-choice alternatives next to each other by more than 80% of the subiects. These items are the following: "My child notices the smoothness or roughness of objects s/he touches" (Perceptual Sensitivity scale); "My child enjoys funny stories, but usually doesn't laugh at them" (Smiling & Laughter scale); "My child smiles and laughs during play with parents" (Smiling & Laughter scale); "My child doesn't enjoy being read to very much" (Low Intensity Pleasure scale). These items appeared not to discriminate among subjects effectively.

2. *Internal consistencies*

The mean, standard deviation, standard error of the mean, range of scores, and a measure of internal consistency, coefficient alpha for each scale are shown in Table 2. The alphas ranged from .54 to .93, with a median of .76. The Shyness scale evidenced very high internal consistency reliability (.93). Alpha estimates for Attentional Focusing, Low Intensity Pleasure, Perceptual Sensitivity, and Sadness scales were low (less than .70).

3. *Homogeneity*

If a given scale is homogeneous (i.e. items in a given scale measure one factor), the variance explained by the first factor extracted by facter analysis should be much greater than the variance by the second factor, and the first factor loadings of items in a given scale should be high. Table 3 presents the results of factor analysis. Factor 1 eigen values evidenced to be much greater than that of factor 2, and relative contributions of factor 1 to the total variance were more than 60% for almost scales. For the Attentional Focusing and Sadness scales, however, eigen values of factor 1 were less than two times of that of facter 2. In about half of the scales, more than 70% of the items obtained high factor 1 loadings (higher than .40).

4. *Discriminant Properties*

Intercorrelations across temperament scale sores are reported in Table 4. More

TABLE 2

Mean, Standard Deviation, Standard Error of the Mean, Actual Range of Scale Scores, and Cronbach's Alpha Estimates of Scores for Temperament Scales

Scales	Number of items	Mean	S. D.	S. E. M.	Actual range of scale scores	Alpha estimates
ACT	13	4.863	.708	.037	3.15-6.62	.77
ANG	13	3.866	.736	.038	1.15-6.08	.78
APR	13	4.533	.691	.036	2.33-6.62	.75
ATF	14	4.268	.544	.028	2.00-6.08	.55
DIS	12	4.083	.729	.038	1.75-6.17	.77
FAL	13	4.822	.740	.038	2.75-6.77	.76
FEA	12	4.314	.884	.046	1.50-6.67	.76
HPL	13	4.550	.890	.046	1.85-6.85	.84
IMP	13	4.197	.733	.038	1.50-6.54	.76
INH	13	4.709	.802	.042	1.38-6.91	.83
LPL	13	5.124	.561	.029	3.46-6.69	.68
SEN	12	5.059	.632	.033	3.11-6.67	.67
SAD	12	3.919	.603	.031	2.00-5.67	.54
SHY	13	4.105	1.178	.061	1.00-6.77	.93
SMI	13	5.612	.629	.033	3.69-6.92	.81

ACT = Activity Level; ANG = Anger/Frustration; APR = Approach; ATF = Attentional Focusing; DIS = Discomfort; FAL = Falling Reactivity & Soothability; FEA = Fear; HPL = High Intensity Pleasure; IMP = Impulsivity; INH = Inhibitory Control; LPL = Low Intensity Pleasure; SEN = Perceptual Sensitivity; SAD = Sadness; SHY = Shyness; SMI = Smiling & Laughter.

TABLE 3

Factor Analysis of each Scale in CBQ[a]

Scales	Eigenvalues		% of items whose loadings are greater than .40.
	Factor 1	Factor 2	
ACT	3.05 (64.1%)	0.97 (20.5%)	76.9
ANG	3.08 (69.1%)	0.92 (20.7%)	76.9
APR	3.04 (67.1%)	0.81 (17.8%)	69.2
ATF	3.09 (46.5%)	1.90 (28.7%)	60.0
DIS	3.06 (73.2%)	0.75 (18.0%)	41.7
FAL	3.52 (69.0%)	0.96 (18.8%)	46.2
FEA	2.88 (69.1%)	0.75 (18.0%)	83.3
HPL	4.27 (75.5%)	0.79 (14.1%)	76.9
IMP	2.96 (62.0%)	1.20 (25.1%)	69.2
INH	3.95 (76.5%)	0.65 (12.6%)	76.9
LPL	2.30 (63.2%)	0.75 (20.6%)	53.8
SEN	2.84 (68.1%)	0.84 (20.0%)	66.7
SAD	1.41 (44.3%)	1.10 (34.6%)	16.7
SHY	6.82 (83.9%)	0.97 (11.9%)	100.0
SMI	3.66 (75.0%)	0.73 (14.9%)	76.9

[a] Principal factor analysis, N = 372. Parcentages in parentheses refer to the percentage of common variance accounted for each factor.

TABLE 4

Intercorrelations of CBQ Scales

	ACT	ANG	APR	ATF	DIS	FAL	FEA	HPL	IMP	INH	LPL	SEN	SAD	SHY
ACT														
ANG	.12													
APR	−.29*	.44*												
ATF	.28*	−.26*	−.05											
DIS	.05	.44*	.21*	−.17*										
FAL	.16*	−.42*	−.14*	.20*	−.36*									
FEA	−.07	.23*	.14*	−.09	.47*	−.13								
HPL	.55*	.20*	.38*	−.03	−.22*	.11	−.35*							
IMP	.64*	.25*	.43*	−.29*	−.01	.07	−.12	.58*						
INH	−.37*	−.34*	−.15*	.57*	−.14*	.26*	.03	−.18*	−.45*					
LPL	−.13	−.06	.28*	.37*	.00	.14*	.14*	−.05	−.07	.36*				
SEN	.07	.06	.22*	.21*	.12	.13	.15*	.07	.03	.37*	.35*			
SAD	−.17*	.47*	.40*	−.02	.27*	−.34*	.23*	.02	−.05	.01	.13*	.17*		
SHY	−.35*	.09	−.18*	.10	.12	−.20*	.20*	−.30*	−.62*	.16*	−.03	−.03	.15*	
SMI	.32*	.01	.40*	.16*	−.05	.28*	.08	.28*	.34*	.16*	.52*	.39*	.05	−.31*

* $p<.01$

than 60% of 105 inter-scale correlations were found to be significant ($P<.01$), and 13 correlations were strong ($r>.40$). The Activity Level, High Intensity Pleasure, and Impulsivity scales were strongly interrelated ($r=.55$, .64, and .58). The Shyness scale showed high negative correlation with the Impulsivity scale ($r=-.62$), and the Inhibitory Control scale showed high positive correlation with the Attentional Focusing scale ($r=.57$). Four negative emotion scales (Anger/Frustration, Discomfort, Fear, and Sadness) were found to be intercorrelated positively with each other (r's between .23 and .47). On the other hand, for positive emotionality scales, while the Smiling & Laughter and Low Intensity Pleasure scales showed to be strongly interrelated ($r=.52$), the High Intensity Pleasure scale was unrelated to the Low Intensity Pleasure scales ($r=-.05$) and was moderately related to the Smiling & Laughter scale ($r=.28$). The relations between the positive emotion scales and the negative emotion scales were not necessarily negative. All of the negative emotion scales were found to be unrelated to the Smiling & Laughter scale (mean $r=.02$), and two scales of negative emotion (Anger/Frustration and Discomfort) were not related to the Low Intensity Pleasure scale (mean $r=-.03$). The High Intensity Pleasure scale, however, related differentially to the negative emotion scales, correlationg with the Fear scale and the Discomfort scale negatively (mean $r=-.29$) and with the Anger/Frustration scale positively ($r=.20$). The Perceptual Sensitivity scale moderately correlated with the Low Intensity Pleasure scale ($r=.35$) and the Smiling & Laughter scale ($r=.39$), while it did not show relations with the negative emotion scales of Anger/Frustration and Discomfort (mean $r=.09$) and the High Intensity Pleasure scale ($r=.07$).

DISCUSSION

The purpose of this study was to examine the CBQ developed by Rothbart. No problem was found in the distribution of answers except for a few items. Estimates of internal consintency attained satisfactory levels for almost all temperament scales except the Attentional Focusing, Low Intensity Pleasure, Perceptual Sensitivity, and Sadness scales, which had low alpha estimates. Alpha estimates (median=.76) obtained in this study are of highest magnitude among temperament questionnaires for infants and children. Hubert, Wachs, Martin, and Gandour (1982) have observed that the following temperament questionnaires have coefficient values in the range from median=.75 to median=.50: the Buss and Plomin EASI-I Scale, Toddler Temperament Scale, Behavior Style Questionnaire, Parent Temperament Scale Revised, Infant Characteristics, and Abbreviated Temperament Questionnaires and Baby and Toddler Behavior Questionnaires. The result of factor analysis for each scale suggests that all scales except the Attentional Focusing and Sadness scales are homogeneous. In two thirds of scales, items more than 60% of a scale showed to have high first factor loadings (>.40). For the RITQ, all scales proved not to have homogeneities (Sugawara *et al.*, 1988). In her study, the proportion of items which have factor 1 loadings (>.40) were from 30% to 60% for each scale. Thus, the results concerning internal consistencies and homogeneity of the CBQ scales suggests that the CBQ is superior to Carey's Questionnaires. The Attentional Focusing and Sadness scales, however, are in need of modification.

Although temperament scales are designated to avoid conceptual overlap, it was found that there were empirical intercorrelations among temperamental scale scores. Some relations were similar to those found in the PRQ and IBQ (e.g., positive correlations among negative emotion scales). While the relations between the negative emotion scales and positive emotion scales were expected to be negative from the result of the infant questionnaire, the result showed these scales were relatively independent of. This is the same result as those obtained in the questionnaire with adults. It is interesting that the High Intensity Pleasure and Low Intensity Pleasure scales are not correlated with each other in spite of measuring positive emotion. This suggests that the pleasure might already differentiate into two independent components in children, similarly to that found in adults. The evidences that the Perceptual Sensitivity scale was unrelated to both negative and positive emotion scales and was moderately related to the Low Intensity Pleasure scale were also consistent with the result in adults, where Perceptual (External) Sensitivity scale was a subscale of the arousal construct. Thus, the inter-scale correlations similar to those in the adults were found to emerge in the children. Although the correlations between Inhibitory Control and Attentional Focusing scales was modest in the PRQ, the relation between these scales were strong in this study. This may imply that these scales are not differentiated in the children, taking into account that these scales were constructed as self-regulation subscales in the PRQ.

To summarize, the CBQ seems to have strong psychometric qualities, except a few scales which need to be reconstructed in order to maximize their internal reliabilities. In future analysis of the CBQ, test-retest reliability and convergence with home observation and laboratory measures need to be assessed.

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APPENDIX

Definitions of Temperament Scales with Sample Items

Activity Level. Level to gross motor activity including rate and extent of locomotion. "My child seems always in a big hurry to get from one place to another."

Anger/Frustration. Amount of negative affect related to interruption of ongoing tasks or goal blocking. "My child gets angry when told s/he has to go to bed."

Approach. Amount of excitement and positive anticipation for expected pleasurable activities. "My child gets so worked up before an exciting event that s/he has trouble sitting still."

Attentional Focusing. Tendency to maintain attentional focus upon task related channels. "When picking up toys or other jobs, my child usually keeps at the task until it's done."

Discomfort. Amount of negative affect related to sensory qualities of stimulation, including intensity, rate or complexity of light, movement, sound, texture. "My child is not very bothered by pain."

Falling Reactivity and Soothability. Rate of recovery from peak distress, excitement, or general arousal. "My child has a hard time settling down for a nap."

Fear. Amount of negative affect, including unease, worry or nervousness related to anticipated pain or distress and/or potentially threatening situations. "My child is not afraid of large dogs and/or other animals."

High Intensity Pleasure. Amount of pleasure or enjoyment related situations involving high stimulus intensity, rate, complexity, novelty and incongruity. "My child likes going down high slides or other adventurous activities."

Impulsivity. Speed of response initiation. "My child usually rushes into an activity without thinking about it."

Inhibitory Control. The capacity to plan and to suppress inappropriate approach responses under instructions or in novel or uncertain situations. "My child can lower his/her voice when asked to do so."

Low Intensity Pleasure. Amount of pleasure or enjoyment related to situations involving low stimulus intensity, rate, complexity, novelty and incongruity. "My child rarely enjoys just being talked to."

Perceptual Sensitivity. Amount of detection of slight, low intensity stimuli from the external environment. "My child notices the smoothness or roughness of objects s/he touches.

Sadness. Amount of negative affect and lowered mood and energy related to exposure to suffering, disappointment and object loss. "My child cries sadly when a favorite toy gets lost or broken."

Shyness. Slow or inhibited aproach in situations involving novelty or uncertainty. "My child sometimes prefers to watch rather than join other children playing."

Smiling and Laughter. Amount of positive affect in response to changes in stimulus intensity, rate, complexity, and incongruity. "My child laughs a lot at jokes and silly happenings."

"BEHAVIORAL SPACE THERAPY": AN ALTERNATIVE APPROACH TO 'HANDICAPPED' CHILDREN

Emiko Gotoh

I. Introduction

In recent years need for intervention to handicapped children has been pointed out by various graups of people. In Hokkaido, there is now emerging a new direction for this end. And there is an increasing number of commuting institutions for those children. Reported here is the result of the efforts for establishing a systematic approach in improving children's communication ability.

Particularly intended in this report is to describe the physical and the psychological environments designed to promote children's communication ability that are based upon the experiences and the practices at two training centers in Eniwa and Hiroshima.

The primary and initial concern among the staffs at the centers in their efforts to build such environment was what kind of perspectives should take toward target children. In this connection, however, the author believes that there gradually emerged a particular approach as we attempted to implement our basic understanding of human beings. Such an approach may allow to dispel a risk of having a gap between the therapists and the handicapped children that is so often observed when therapists are too much concerned with the children's handicaps and treat them as "special". Rather often people tend to distinguish the "healthy" and the "handicapped" in order to articulate the significant points in training and education. However, this very distinction, as many of the therapeutic programs and case reports made at various conferences have shown, has worked rather as a barrier and hindered the relationship between the therapists and the children. Most important, be it in care-taking or in education, is an approach that rejects the position to postulate unrealistic "boundary" between the normal and the abnormae.

That is to say, what is asked for a therapist is to see and accept the child as he/she is, and to have an appropriate understanding of human nature, instead of being captured only by the handicaps. In that sense, our therapeutic job will mark the first step when a therapist has come to understand the handicapped child as an individual just like an healthy normal child having an independent personality.

In many cases, people who are working with those children tend to pay too much attention only to "problematic characteristics" and are concerned with improving the "problems". Consequently, most therapists are inclined to separate themselves from the children, weakening their own "raison d'etre", thus tend to produce a phenomenon

Request for reprint should be addressed to Emiko Gotoh at 7-5-5 Yamate machi, Hiroshima cho, Sapporo gun, Hokkaido 061-11 Japan.

of so-called "functional isolation of therapist".

In the past, behavioral characteristics of the handicapped children have been categorized in various ways, and sometimes attempts have been made to get clearer pictures of handicaps, only by giving names to each handicap. Based on our experience, however, we have come to believe that each child we have worked with can be grasped on the same dimensions as all the other children, in that he/she has human characteristics for performing full functioning as an independent human existence. What we have to take more importantly is rather that to what extent stabilized and functionalized are the foundations of interactional behavior with various things and people in the environment which are fundamentals for living a life as social existence. The point we have to look at is whether the handicapped children are performing adequately their functions in the interrelational systems with objects and people in these social settings.

When we look at handicapped children, we are liable to focus on lowness of their ability characteristics of the children. The concept of the "handicap" should not be defined only by their ability characteristics, instead it should be found out in their "interrelationship" with the environment. From this perspective, it would be important to identify the developmental tasks for the handicapped children in order for finding an answer to the question, "what kind of interactions we could have with those children who are living their lives and continue to live as social existence hereafter too".

In the following sections I would like to describe what we have practiced at the training centers in two towns in greater Sapporo district, keeping in mind the points of view mentioned above.

II, Clinical Practices at the Training Centrs for Handicapped Children

Our clinical activities at the centers gave us opportunities to meet children with various problematic behavior. Those who came for counseling indeed seemed to have problems of various kind in their behavior as their mothers claimed. However, as we observed, we came to recognize that most of such claimed behaviors were associated with impediments in their communication to a great extent and that was among the causes to delay their development.

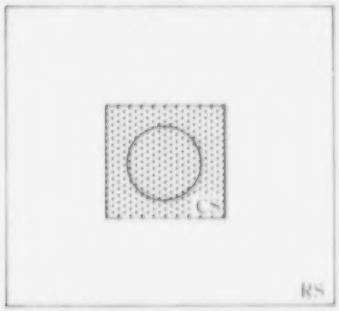
The unique aspect of our clinical activities is to look at the children from another perspective in broader terms as having communicative disability, and are provided programs in accordance with our perspective. Communicative behavior refers to not only giving and receiving information. It also includes expressing emotions and desires to be associated with others as well as letting out their egos and even accepting others, in other words, the whole expressive behavior. And this communicative behavior strengthens its meaningfulness as the children come in to contact with others. Therefore we attached importance to events and objects as well as people that surrounded the children with great attention and tried to find significance to each of their behaviors for possible improvement. This was the primary theme of our program.

The behavior through which the children share the time and space with others is the "associated behavior". The "behavioral space therapy", a therapy we devised, focuses upon this associated behavior (Gotoh, Gotoh, and Miyajima, 1980). This ther-

apy was applied at the Hiroshima Welfare Center and is now in the process of further improvement (Gotoh, Ogasawara, Gotoh, Fukuhara, 1984). The background that led to the "behavioral space therapy" is as follows.

What we had to do first in our initiative for a group therapy for the purpose described above was creating the situation with a workable environment that would induce a certain possible direction not only for individual children but also for the group as a whole. It had to be an environment that would encourage the child to get interested in things and people around him/her and motivate him/her for a further action. The scheme also had to have therapists organically involved. Thus came the physical set-up of a "gathering place".

A "gathering place" was designed in such a way to encourage the children to share the time and space with others. The so called "stage" with two layers, a square bottom (244 by 244cm) of about 25cm's height and a round top with a diameter of 180 cm was prepared. Fig. 1 shows the physical setting of this stage.



Notes:
CS: Communicative Space
RS: Round Space

FIG. 1 Behavioral Space

Secondly, toys were selected that would inevitably bring the children to come into contact with others. Toys actually used were such as large blocks that could be made into a locomotive with wheels, colored balls and fancy tunnels. Other things such as trampoline and play house set, picture books and mini cars with which children could play alone were excluded for the reason that they would not encourage them to involve in group activity.

Thirdly, we applied a time control scheme by introducing music. The music would give a sign to the children to prepare themselves for an intermittence for a change in activity.

Fourthly, a chief therapist was placed with a distinct role to regulate the activities which otherwise might be too diffuse without direction, although spontaneity was crucial. The chief therapist would work to overcome incoherence that has been so often observed among the therapists in a group therapy. Important as well is coherence among the children, which was also to be promoted by the chief therapist, together with expanding interface between the children and the therapists themselves to give a certain direction to their activities. The other therapists would be required to

act in line with the chief therapists in order to give a focus to their activities.

Our group therapy at the centers consisted of two main programs, the image expression learning in the nursery room and the behavioral space therapy in a play room. The image expression learning can be divided into four settings. The first setting is the "gathering place". Here chairs are placed in circle. Children and therapists sit like "sandwiches" with the chief therapist at the center. Intended in this phase is to activate children's expressive behaviors through hand play, greetings, and responding to others. Reflecting the actual processes in the therapy, therapists tended to force children to sit down on the chairs right after they entered the room hand in hand with children, probably because that they were overconscious of the beginning of therapy and too much concerned with letting children sit down. This is one of the problems that need to be overcome, since the program is intended to focus upon children's feelings and bring about spontaneity in their activities. This was one of the issues that were often taken up at the case conference.

The kind of problem was often found when we formed a group of emotionally disturbed children. They often preferred to stay in the corner, or by the wall, or near the window. When the children did not have enough experience in therapy, there were only therapists at the "gathering place". Mentally retarded children seemed to react and adapt more easily to this situation.

All these experiences led us to consider more about the make up of the group members. When children with various behavioral characteristics were grouped together, we found there was more interaction among them, which subsequently brought some toward the "gathering place" with others following them. The therapists' role in such a situation was how to react toward their movement. They were never to direct them with a direct gesture like inviting them to gather at the center. The make up of the group seemed quite significant, since it affected and sometimes fortified, the functional linkage of the members.

In general, members of the group are decided by the therapists on the basis of similarity in their ability or behavioral characteristics. However, our findings were that a group with varied characteristics worked better to reciprocate their differences and induce qualitative change.

Grouping of children based on homogeneity or similarity is very unnatural in daily situations, and the groups of such kind should be idiosyncratic organizations constrained by special purposes. Taken this idea, there will appear peculiar groups which are exclusively of the elderlies or of handicapped children. Therefore we included in the program joint activities with the children from the near-by nursery school. The program at the Hiroshima Welfare Center had mothers work together with the therapists.

The very term of handicap contains in itself a negative evaluation on children with particular behavioral characteristics which are some how deviant from development and behavioral standard is in "normal" children. This type of position is hard to come with our approach. We take handicaps as certain types of behavioral characteristics, and we have kept seeking for common values through working on those characteristics. This is analogous to the efforts made when one learns about foreign culture,

where differences are respected and similarities sympathized. Through these interactions we will be able to find the ways to appreciate the properties of individual person's behaviors.

The second setting is intended to develop images of environment around the children. It was designed in such a way to make it easier for them to react and retain the images of people and objects they were likely to see in every day life, i.e. telephones, TVs, or wooden blocks and large balls they played with during the therapy, or people they came in contact with, i.e. mothers, themselves, therapists, and friends, or various events in which they were also involved. These were all made into slides and were shown to them, not individually but as a group. The room was kept dark to make it easier for them to concentrate. Very often children who were reluctant to come to the "gathering place" were found to show interest in this setting. The atmosphere became lively with their spontaneous verbal and vocal responses to the therapists' remarks.

The third setting is for expression learning. Expression learning was to stimulate the children's desire to express feelings, to let their egos out and to increase their expressive ability, whereas image learning focused on learning to be attentive to objects and people around them and on their cognitive activities to take in stimuli from outside. Materials used and the setting were designed to meet this purpose. More specifically, picture painting and rhythmic expression were introduced. These two have a common characteristic of using objects. A similar idea was also applied in the play room where toys instead were offered as a means to help extend their awareness of the outside world. Activities such as finger painting that would have children touch paints directly were intentionally excluded. Rather, having them use intermediaries such as paint brushes was thought to work on their unintentional expressive activities and thus give them a behavioral direction because of the very nature of the brushes. We had tried this idea before and empirically found that it is useful for activating children's motivation.

Picture expression learning focuses on activity to use paint brushes. And, rhythmic expression learning is intended to induce activity in which the static and dynamic processes supplement each other, by devising the sequence of the activity.

In practice children listen to the musical pieces which are arranged in accordance with the above mentioned idea, engaging in free expressive activity with the therapists. Thus, there are provided them with the opportunity to develop the attentiveness to listen to particular targets.

The other half of the activities here comprises mainly of beating various things with drum sticks, resulting in spontaneous production of sounds.

In the picture expression learning, the children sat on their chairs at the table. They receive from the therapists drawing papers and brushes, which prepared them for the coming activity. The paints used here are boiled wheat powder with poster colors, and are made rather thick in order for making it responsive to the activity of painting by children.

There were some children who would take up the brushes but were reluctant to start painting, or others who had difficulty to start with, being afraid of making their clothes messy. But once they had brushes with plenty of paints with the therapists'

help and saw a drop of paint fall on the paper, they became eager and were motivated for a next try. Through the tactile feeling of drawing a line with brush and the vividness of the new lines they draw, they have come to challenge the task again and again spontaneously.

We found that the hand-made paints were better than crayons or felt-tip pens, because the act of putting the paint on the brush itself excited and interested them. Furthermore, one thing which should be stressed here is that through these activities the therapists can have chances to intervene in more natural ways.

After children were through this task, all the paintings were put on the wall, and some children were observed gazing at their own, while eating cookies in the snack time. It is, however, partly observed that children failed to strengthen motivation to engage in this activity and to develop their skills of drawing, and rather weakened the liveliness of their awareness for this task. This should be a task for us to pursue in our future endeavor. Examination of the appropriateness of the materials is left as a task for us.

As described earlier, rhythmic expression learning, on the other hand, was set in an environment with the specifically arranged music played on the piano. Hula-hoops and a mattress were prepared so that the children could easily move about with images they would get from the music which was usually repeated. Their reactions were varied. Some listened intently, coming close to the speaker. Others were attracted by hula-hoops and the mattress but remained there without engaging in any actual activity. There were still others who kept running with the therapists, jumping or were just lying on the mattress. In the light of the whole sequence of the therapeutic procedures, all these seem to have happened rather abruptly and the setting here has come to lack the necessity in the planned sequence of activities. Children were often found not fully active. As for beating with drumsticks, it was an activity the therapists found difficult to take part intently. They went about beating various things and listened, and just remained in a state they cannot find the directions toward which they should bring the children to develop the activity.

The fourth setting was a dining place. They sat together around the table and had snacks. They were inclined to remain at the "gathering place" longest with their lively vocal and verbal expressions.

Described so far are the flows of activity for the image expression learning. And from the beginning point of time of the fourth setting, children moved into a play room. Music was played until all the activities there were over. The music had different melodies to give signs and to coordinate the activities there. Music with lyrics such as "Sekken-san" (Mr. Soap) or "Pajama-man" was played when there was going to be a clear change in the activity. Also included were various classical pieces, each arranged to be three or four minutes long.

The effect of the background music is not yet unanimously supported, although it has been recognized to be effective in coordinating the activities. As to its effect on the children, there have been no opportunities to well look into except that it worked in such a way to prepare them for the next phase of the program.

III. Discussions

Image expression learning is one form of the behavioral space therapy, which would be ranked in higher order of "taskfulness". On the other hand, those activities conducted in the play room had instructive forms that were already well established in the behavioral space therapy and allowed more freedom in the children's movement. Image expression learning and the program in the play room share a common characteristic in that they prepared a setting where the time and the space were shared and that both are devised for transforming children's behavior into the more meaningful behaviors in social contexts through their expressive activities. Reflecting what we have done so far, we can see that there still remain many problems we have to tackle with. The most important is that we should not keep the behavioral space therapy, which has been developed from intervention through the direct contacts with the children in an efforts to find appropriate directions, in a confined realm of training techniques.

In order to refine further this therapy, an educational philosophy based on human understandings such as how to regard disabled children and relate to them must be established through clinical practices. It means that what is really awaited is further growth of awareness on the part of therapists.

Here is a summary of what I found in this approach, particularly in the play-room setting as the chief therapist. One distinct feature of this is that there is placed a stage at the center of the room. This indeed worked to bring about changes in the children's behaviors. Children who had kept standing by the wall, leaning on it with their back, or just wandered around at the corners, or kept looking out of the windows, have come to approach the stage, and run or walk around it. They also began to show the behaviors such as sitting or standing on it, thus more spontaneous actions around the became more conspicuous. Therapists were also observed to be involved in the activities centering around the stage and eventually began orienting more activities toward and around it. By making the stage as a pivotal place, I myself began to find consistency and direction in the locus of my behaviors as the chief therapist.

Furthermore, because of the fact that in this therapy the toys are selected in the ways that allow interrelatedness among the members, and by using the toys effectively, each therapist has come to show indirectly relating behaviors toward children and it has become much easier for therapist to create settings where appeared more spontaneous sharings of toys along with the streams of activities. Their recognition of the toys having similar roles as theirs increased flexibility and depth in their relations with the children.

Therapist's behaviors like this seem very effective in decreasing forcible unilateral relating behaviors of the therapists, just like their direct trespassing into the children's inner world. Through indirect relating, behaviors such as placing a toy ostentatiously by the child, the therapist keeps waiting for spontaneous behaviors to occur, and once they occur the therapist accept and situate them in the streams of the whole activities. It should be noted that the very presence of the toy and play things has had great significance in that it allowed to produce conditions for this type of "therapy of waiting" to operate naturally. And of course the provision of the play room

specifically designed for the purpose contributed a great deal.

One last point that I want to add is that this is a program through which therapists themselves have had the chance to grow through the encounter with those children in this approach. This approach does not leave a room for therapists to indulge themselves in irresponsive position, thus this should have been extremely strenuous and sometimes perplexing for those therapists who have been accustomed to the position of "stimulus giver". The most significant part of this therapeutic program is that the sequence of activities always reminded the therapists that their roles can be meaningful only when they involved themselves in the process and moved forward together with the children. To onlookers' eyes our approach may look not so different from the ordinary ones at the nursery school. There is, however, no doubt that this approach played an important role in preparing a scaffold for proceeding to further steps in the job of helping those children develop the communicative behaviors, and in activating the programs at the local community centers for handicapped children.

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ABSENCE OF AVOIDANCE RESPONSE TO IMPENDING COLLISION IN CHILDREN

Shing-jen Chen
Hokkaido University
Geert J. P. Savelsbergh
Royal Netherlands Academy of Arts and Sciences
Free University, Amsterdam, The Netherlands

INTRODUCTION

The development of avoidance response to impending collision in human infants was investigated by several researchers during the 1970's (Bower, Broughton, & More, 1970; Ball & Tronick, 1971; Yonas, Bechtold, Frankel, Gordon, McRoberts, Norcia, & Sternfels, 1977; 1977). One of the main issues of these studies was the onset age of the avoidance response. The avoidance response in question was the backward movement of the subject's head, and the onset age depends on the interpretation given to this response. That is, whether as a result of visually tracking the visual stimulus, as argued by Yonas *et al.*, (1977), or as an avoidance response, as argued by Bower *et al.*, 1970, 1977). This paper does not try to make a judgement on this issue, it suffices to say that in any case, these researchers seemed to agree that infant older than 4 or 6 months should show avoidance response in face of impending collision. Although the onset age issue can have great implications on the view of the nature of behaviour development (i.e., innate vs. learned etc.), its solution does not seem to inform us much about the development aspect of perception and action coupling. Furthermore, the issue as such does not lead to the formulation of question about what older subjects might or might not respond, because common sense suggests that as a competence observable in 6 months old infants, subjects a few years older can normally be assumed to have it. The authors would not have given a second thought to this view, had the first author not been puzzled by his failure in observing any response in young children when presented with a video clip which he had tested successfully with adult viewers in another experiment. This paper reports on an experiment to confirm that first observation.

EXPERIMENT

Subjects. 76 subjects whose age ranged from 3 to 24 years were tested.

Apparatus. Visual displays were presented by video monitor. The video monitor measuring 29 inch (73.66cm) diagonally, mounted on a table 60cm above ground, was

Request for reprint should be addressed to Shin-jen Chen at Faculty of Education, Hokkaido University, Sapporo 060 Japan.

placed 1.35m away from the subject who was seated on a stool 30cm (children) or 41 cm (adults) high, so that the subject's eye hight was about the middle of the monitor.

Behind the monitor, a high sensitivity black and white video camera (A) with a zoom lense, mounted on a tripod 125cm above ground, was used to observe the subject's response. Another camera (B) at the side of the subject focused on the video monitor. A composit image consisting of the subject's full face, from camera A, and an inset of the video display presented to the subject, from camera B, was tape-recorded through out the experiment using a video recorder kept in a separate corner invisible to the subjects.

Two sets of video clips were presented to the subjects. (a) Base Ball: depicting a ball, being pitched by the pitcher, moveing toward the viewer, missing the batter and hitting on the net in front of the camera. The clip lasted 3 seconds. The speed of the ball was estimated to be about 30m/sec (or 3000cm/sec). (b) Doll: depicting a doll falling from 6m above and landing on the camera. The clip lasted 12 seconds. These clips were in black and white, and were inserted into a popular colour animation. All subjects were presented with the same material.

Procedure. The subjects were brought invidually to the laboratory by a research assistant. Subjects were told that two events in black and white would be presented in the middle of a short animation and the task was to identify the events after viewing. Subjects viewed each set of clip only once. Eye blinking and dodging of head (abrupt movements of head backward or sideway) about 100 msec before and after the collisions were analysed and counted by the experimenter and two research assistants. Whenever disagreement occurred, the analysis and counting were reexamined by the three until satisfactory result was reached. Because of low frequency of occurrence in all types of "dodging of head", only data concerning eye blinking will be reported here. Some occurrences of eye blinking were also accompanied by dodging of head.

Subjects were prompted to watch carefuly just before the start of the intended clip and asked what the event was after each viewing. Aswers were considered correct when "base ball", "ball game", "ball collided", or "doll falling", "doll collided" "something falling" or their equivalents were mentioned.

Results

Development of avoidance response. Table 1 shows the development of avoidant response (eye blinking) to the two video clips containing impending collision events. The children subjects (N=60) were divided into 3 groups and the adult subjects, age ranged from 20 to 24, formed one group. Due to technical failure, the Doll clip condition suffered the loss of one subject each for the ages of 5 and 6. The two conditions (i.e., the Base Ball and the Doll) elicited different patterns of eye blinking. While Base Ball elicited an increasing frequency across ages; a decreasing frequency across ages was observed in the Doll condition. Furthermore, the Base Ball failed to elicited any eye blinking at all among subjects of the youngest group (0%), and only one out of 20 subjects in the next youngest group (5%). In contrast, the Doll clip elicited eye blinking in 36.8% of the subjects of the youngest group, and 26.3% in the next youngest group (Figure 1). An ANOVA showed that there was a significant interaction

TABLE 1

Occurrence of Eve Blinking

Age	[BASE BALL] No. of S Tested	%	Sum %	[DOLL] No. of S Tested	%	Sum %
3	1	0		1	1	
4	7	0		7	4	
5	12	0		11	2	
	(20)	(0)	0 %	(19)	(7)	36.84%
6	10	0		9	1	
7	5	1		5	2	
8	5	0		5	2	
	(20)	(1)	5 %	(19)	(5)	26.3%
9	6	1		6	0	
10	8	2		8	1	
11	6	3		6	1	
	(20)	(6)	30 %	(20)	(2)	10 %
20	1	1		1	0	
21	2	2		2	0	
22	9	4		9	1	
23	3	1		3	0	
24	1	1		1	0	
	(16)	(9)	56.3%	(16)	(1)	6.25%

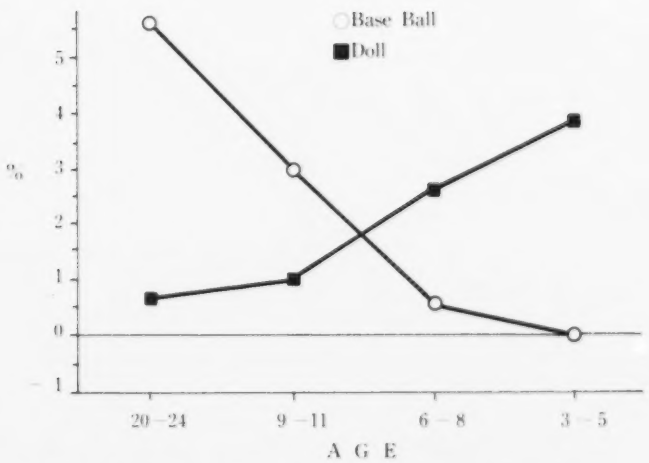

FIG. 1 Avoidance Response (Eye Blinking) to Two Types or Impending Collision Events.

between age of subjects and the type of video clip shown ($F=9.3074$ $df=3$, $P<.001$). *Identification of event and avoidance response.* Table 2 and Figure 2 show the result of an analysis of the developmental trend of the relation between the correctness in event identification and the occurrence of eye blinking. Partly because of difficulty in under-

TABLE 2

Eye Blinking and Event Identification

Age group	N =	Base Ball				N =	Doll			
		Correct		Incorrect			Correct		Incorrect	
		+	−	+	−		+	−	+	−
4 − 5	16	1	(6.3%)	15	(93.7%)	16	3	(18.8%)	13	(81.2%)
		0 0%	1 100%	0 0%	15 100%		0 0%	3 100%	4 30.8%	9 69.2%
6 − 8	19	2	(10.5%)	17	(89.5%)	18	10	(55.6%)	8	(44.4%)
		0 0%	2 100%	1 5.9%	16 94.1%		2 20%	8 80%	2 25%	6 75%
9 − 11	20	17	(85%)	3	(15%)	20	17	(85%)	3	(15%)
		7 41.2%	10 58.8%	0 0%	3 100%		2 11.8%	15 88.2%	0 0%	3 100%
20 − 24	16	16	(100%)	0	(0%)	16	16	(100%)	0	(0%)
		9 56.3%	7 43.7%	0 0%	0 0%		1 6.3%	15 93.7%	0 0%	0 0%

+ / − represent presence and absence of eye blinking respectively.

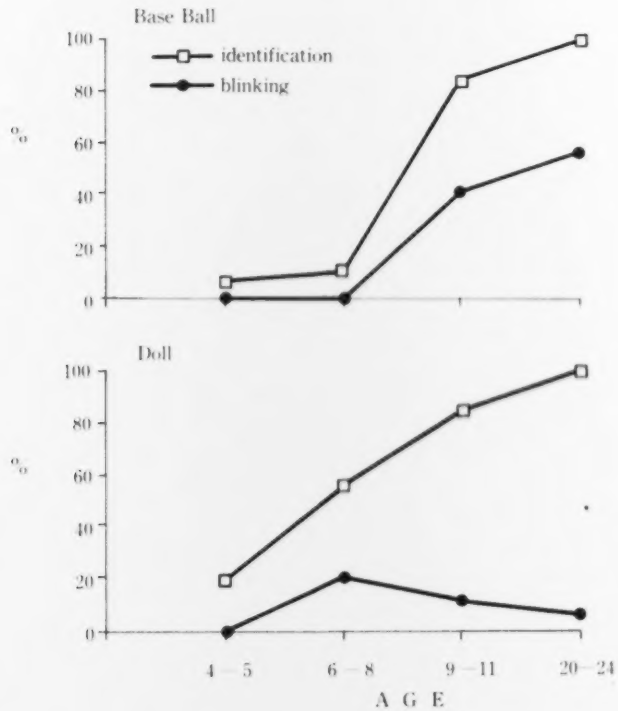

FIG. 2 Relationship Between Correctness in Event Identification and the Occuirence of Eye Blinking.

standing the experimenter's questions, the younger groups suffered a loss of 1 to 4 subjects. The majority of the youngest groups failed to identify correctly the events shown. While the Base Ball was hardly correctly identified at all (10.5%) by the next youngest group (6 to 8 years), the Doll was correctly identified by 10 out of 18 (55.6%) of the subjects in the same group. The oldest group of the children subjects showed greater increase in correct identification of both events (both at 85%).

Figure 2 shows the relationship between correctness of event identification and the frequency of eye blinking. In the case of Base Ball, the low percentages of correct identification in the two younger groups (6.3%, 10.5%) were accompanied by 0% of eye blinking, and the higher percentages of correct identification of event of the oldest group of children and the adult (85%, 100%) were accompanied by only moderate frequencies of eye blinking (41.2%, 56.3% respectively). In contrast, the Doll event was correctly identified by increasingly larger percentages of subjects (18.8%, 55.6%, 85%, and 100%), but the frequencies of eye blinking remained low (between 0% and 20%) for all groups.

Discussion

A general conclusion that can be drawn from previous studies on impending collision is that although the exact onset time of avoidance response depends on how one interprets the backward movement of the young infant's head (i.e., either as eye tracking or as avoiding backing), the appearance of avoidance response after 6 months is considered established. However, the result of this experiment showed that under the same conditions, the video clip that elicited eye blinking from adult subjects failed to do so entirely in children from 3 to 5, and only in one out of 20 children from 6 to 8 years of age. The result of this experiment suggested that the Base Ball event which contained object moving at about 30m/sec was effective (convincing enough in spite of the possibility of an awareness that the event was just a virtual one and not a real one) for the adult subjects but was not detected by the younger subjects. On the other hand, the Doll event which contained a falling object at the speed of about 8m/sec was effective for the younger subjects but not convincing enough for the adult subjects. The different effect of the two video clips was further evidenced by the result concerning correctness of event identification. The analysis showed that for both events, the percentage of correct identification reached 85% in the oldest children group (9 to 11) and 100% in the adult group, the frequency of eye blinking showed greater difference. This indicates that as the event was correctly identified, the Base Ball event became more effective but the Doll event became progressively less so. Similarly, with the two younger children groups, the Doll event was corretly identified by more subjects and elicited more eye blinking than the Base Ball event.

An analysis of the difference between the two video clips used in this experiment showed that they differed in at least three aspects: (a) length of event, (b) speed of approaching objects, and (c) velocity (acceleration vs. deceleration).

It has been shown that looming effect does ont involve the identification of the approaching object such as shape or nature of the object (Ball & Tronick, 1971; Schiff, 1965). However, what was in question in this experiment was avoidance response.

In previous studies on impending collision, no interest has been shown on the conditions of occurrence of avoidance in particular. Previous authors focussed on such issues as the onset age of eye blinking, or different effect of virtual and actual approaching objects.

When viewing virtual impending collision, the fact that avoidance response is not elicited all the time suggests that looming offect is not the only necessary and sufficient condition for the occurrence of avoidance response. It seems possible for a visual stimulus to generate perfect looming effect but to elicite no avoidance at all. Why? Because the stimulus is not convincing enough. In order for avoidance response to occur when viewing an impending collision event on a monitor or screen, the visual stimulus has to be convincing enough that the subject's ability to inhibit avoidance response from occurring is rendered inactive. Look at it in this light, the 'convincingness (or effectiveness)' of a certain visual stimulus in eliciting avoidance response can be seen as dependent on factors pertaining to both the subject (e.g., age and gender) and to the event (e.g., speed and nature of the object such as size, harmfulness, etc.).

The result of this experiment suggested that the Base Ball event, with the approaching object moving at 30m/sec, was convincing enough for the adult subjects but too fast for the younger children subjects even to identify. On the other hand, the Doll event, with the doll falling at the speed of 8m/sec was vonvincing enough for the young children but too slow to be convincing enough for the adult subjects.

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LOOMING: AN INFORMATION SOURCE FOR AVOIDING AND MAKING CONTACT

Geert J. P. Savelsbergh
Royal Netherlands Academy of Arts and Sciences
Free University, Amsterdam, The Netherlands
Shing Jen Chen
Hokkaido University

Introduction

In 1959, Purdy signalled the potential effect of 'looming' for judgement about when an approaching object will make contact with her or him. Experimental work by Schiff, in the early sixties, showed that expanding shadow projections evoked avoidance behaviour in rhesus monkeys (Schiff, Caviness & Gibson, 1962), adult fiddler crabs and two week old chickens (Schiff, 1965). In the mid seventies, it was David Lee (1976), who demonstrated that the pattern of optical expansion, brought about by the relative approach between the actor and the environmental structure of interest, contained predictive temporal information about making contact. The purpose of this paper is to provide evidence for the value of the predictive visual information source called 'looming'. This in respect with avoiding and making contact with the source which causes the looming.

Avoidance behaviour

A number of studies on impending collision investigated the development of avoidance or defensive behaviours in response to approaching objects (Ball & Tronick, 1971; Bower, Broughton, & Moore, 1970; Schiff, 1965; White, 1971; Yonas, Bechtold, Frankel, Gordon, McRoberts, Norcia, & Sternfels, 1977). One concern of the researchers on this topic was to determine if impending collision stimuli elicite avoidance response from animals reared in darkness or newborn infants (i.e., if avoidance to "looming" was innate or learned). A further issue was to determine the onset age of avoidance response in human infants. Using dark-reared nonhuman species, Schiff found that several animals responded avoidantly to optical expansion patterns (Schiff, 1965). However, in some species, the younger subjects (e.g., kittens of 26 days of age) failed to respond relialy, suggesting that for some higher mammals, the avoidance response may have to be learned. Testing on human infants, ranging from 8 days to 11 weeks, two earlier studies reported that avoidance responses were observed in both real and virtual situations (e.g., styrofoam object vs expanding shadow on screen) (Ball &

Request for reprint should be addressed to Dr. Geert J. P. Saversbergh at Royal Netherlands Academy of Arts and Sciences, Amsterdam, The Netherlands.

Tronick, 1971; Bower, Broughton, & Moore, 1970). These positive findings, however, were confronted with studies by Yonas *et al.* (1977), who reported that avoidance response was absent in their youngest subjects of 1- to 2 month old infants. In addition, they examined various concurrent behaviours, such as head rotation, head withdrawal, and visual tracking. They pointed out that the positive findings by Ball & Tronick (1971) and Bower *et al.* (1970) ere the result of designating the infants' tracking response as avoidance response. They concluded that the negative results of their own testing of 1- to 2 month olds were in agreement with the earlier data on the development of the blink reflex obtained by researchers such as Gesell in 1975, Kasahara and Inamatsu, in 1931 and White, in 1971 (see Yonas *et al.* 1977).

While these previous studies used infant subjects ranging from 8 days to 9 months old, no study of children beyond this age seems to have been attempted yet. Furthermore, although several speeds of the approaching objects were tested in these studies, with one exception (i.e., White, 1971), no study tested the effect of more familiar objects such as an approaching baseball, a vehicle coming towards the viewer, or a falling piece of toy or furniture etc. At the present the authors are conducting a study in order to investigate the development of avoidance response of children from 3 to 11 years of age to impending collision, using video clips depicting scences of different degrees of familiaity as well as speeds. Our pilot observation suggested the importance of identification of event in avoidance response to impendng collision situation, because the absence of avoidant eyeblinking in some subjects was attributed by the sbjects to "not knowing what was going on" (Chen & Savelsbergh, 1993).

The expanding optical projections in the aforementioned studies thus specified imminent collision and, therefore, evoked avoidance behaviour. However, the inverse of the relative rate of dilation, denoted 'tau' (Lee, 1976, 1980) is not only useful in avoidance behaviour but also in circumstances require to make contact.

Making contact

Lee (1976, 1980) demonstrated that the pattern of optical expansion, brought about by the relative approach between an object in the environment and an actor, provides predictive temporal information the (remaining) time to contact being directly specified by the inverse of the relative rate of dilation of the closed optical contour of an approaching object, as it is generated in the optic array (the optical variable Lee called *tau*). Even in situations where a discrepancy exists between *tau* and the real time to contact i.e., in situations where the approaching object is accelerating (e.g. a falling ball that has to be punched away) subjects still gear their actions to the optical variable tau and not to the real time to contact (Lee, Young, Reddish, Lough & Clayton, 1983).

The use of optical time to contact information in control of action has been explored in a variety of contexts over the years e.g., automobile driving (Lee, 1976; McLeod & Ross, 1983; Cavello & Laurent, 1988), striking the take off board in long jumping (Lee, Lishman & Thompson, 1982), the folding of the wings by diving gannets (Lee & Reddish, 1981), the visual control of the step length during running over irregular terrain (Warren, Young & Lee, 1986) and the regulation of the landing of house flies (Wagner, 1982). More recently, Bootsma and Van Wieringen (1990) have invo-

ked a similar explanation in the control of a directed strike of a table tennis ball and for the regulation of gait in the jumping of obstacles by horses, Laurent, Dinh Phung and Ripoll (1989) have demonstrated that it is the retinal expansion pattern of the obstacle that is used by the riders.

With respect to muscular activity by means of EMG measurements evidence is found for the use of the expansion pattern in order to control the action (Dietz & North, 1978; Sidaway, McNitt Gray & Davis, 1989). For example, Sidaway *et al.* (1989) have demonstrated that preparatory muscle activation prior to impact landing from different heights is triggered by a specific *tau* value, e.g., a constant time before contact, like Savelsbergh and co-workers showed for the muscular activity in one handed catching (Savelsbergh, Whiting, Burden & Bartlett, 1992).

Fascinating as all these experiments have been, they only demonstrate that the various actions are consistent with the use by subjects of *tau* information and not that subjects, necessarily, make use of such information. It remained for Savelsbergh (1990; Savelsbergh, Whiting and Bootsma, 1991; Savelsbergh, Whiting, Pijpers & van Santvoord, in press) to carry out a direct manipulation of the optical expansion or looming pattern and, thereby, to provide firmer evidence for the use of *tau* information by subjects in the context of ball catching actions. In their experiments, balls of constant size as well as a ball the diameter of which could be changed during flight (deflating ball) were used. In contrast to the balls of constant size, the deflating ball provides the subject with optical expansion information which is non verdidcal in the sense that the time-to-contact it specifies as it approaches is different from that which would be specified by a ball of constant size. The findings of these experiments demonstrated that the closing of the fingers was later for the deflating ball than for the balls of constant size thus confirming that subjects must have been making use of retinal expansion information for making time-to-contact judgements in catching. All in all, the series of experiments, briefly discussed above, provide a catalogue of evidence in support of the explanatory power of 'direct' perception (Gibson, 1979) and of a *visual* control of timing in a variety of ecologically appropriate skills.

Conclusion and discussion

A conclusion that can be derived from previous studies on impending collision is that although the exact onset time of avoidance response depends on how one interprets the backward movement of the young infant's head (i.e., either as eye tracking or as avoiding backing), the appearance of avoidance response after 6 months is considered established.

A wealth of empirical evidence has provided evidence that subjects can use two dimensional time-to-contact information. The effect on performance of directly manipulating the optical expansion pattern has been, empirically, addressed by Savelsbergh *et al.* (1990, 1991, 1992). These experiments strongly indicate that such coupling is based on time-to-contact information specified directly by the relative optical expansion pattern. Stoffregen and Riccio (1990) showed that peripheral as well as focal vision can be used in order to judge time-to-contact based on the expansion pattern.

Although all the experiments reported here have been in the visual mode, note

should be taken of Fitch, Tuller and Turvey's (1982, p. 277) point 'that the information needed to tune muscle systems is not tied to a particular sense modality'. It is, perhaps, that time-to-contact information is not limited to the visual mode that led Lee (1989) to argue for the generality of the *tau* principle. For a variety of information sources (e.g. sound, heat etc.), he speculates, time-to-contact judgements are based on the general principle of *rate of intensity* change. Rosenblum, Carello and Pastore (1987) as well Schiff and Oldak (1990) demonstrated that subjects can make reliable judgements about the timing of a moving sound source.

An experiment on vision substitution devices for the blind conducted by White, and his co-workers showed that a matrix of vibrations acts as a 'tactile' array (White,Saunders, Scadden, Bach-Y-Rita & Collins, 1970). In this experiment one vision substition system transmitted a pattern of intensity differences from a portable television camera to a bank of mechanical vibrators on the subject's back. This matrix of vibrators acts like a 'tactile' array, which can be made to change by the optical array as presented by a camera. While testing this device, the experimenter accidentally moved the zoom lens. This resulted in a rapidly expanding tactile array on the back of the subject which was followed by an avoidance reaction on his part. The expanding tactile array, like an expanding optic array, specified that an object is about to make contact.

The series of experiments of Savelsbergh (1993) provide empirical support for haptic time-to-contact judgements based on pressure changes caused by an approaching air flow. The task was to avoid contact with this approaching airflow (hair-dryer) by adducting the hand just before contact. The findings indicated that subject did not adducted their hand at some absolute pressure level but supported the idea that the judgements of the time of arrival of the object were based on the rate of pressure changes. In a second experiment, subjects were required to make judgements based on cold or warm airflow or on the bases of auditory information. The results showed that all three sources were useful in order to make time-to-contact judgements and support David Lee's (1989) notion of the existence of a 'general' tau.

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執筆者紹介（掲載順）

ジョン・カークランド（准教授・マッセー大学・ニュージーランド）

フランク・セルフ（准教授・セント・ジョセフ大学・アメリカ；北大教育学部・フルブライト客員教授）

草薙　恵美子（大学院教育学研究科博士後期課程）

後藤　恵美子（札幌市，北広島町，恵庭市嘱託・心理専門職員）

陳　省仁（助教授・北海道大学）

ヒールット J.P. サフェルスベルハ（専門研究員・王立科学芸術アカデミー・オランダ）

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〒060 札幌市北区北11条西7丁目

電話(011) 716-2111 内線3109

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Nishi 7, Kita 11, Kita-ku, Sapporo 060 Japan

Phone: 011 716 2111 (Ex. 3109)